Machine and Tool BLUE BOOK

DIGEST OF THE METAL WORKING INDUSTRY

JULY 1947

THIS MONTH

Hole Location Methods	137
Operation of Engine Lathes	
Plug Gage Simplifies Gaging	
† drodynamic Die	189
chine Tool Show News	
General Information	227
NMTBA Enjoys Colorful Background	234
Chicago: Host to the Show	240
History of Machine Tool Industry	247
What's New in Metalworking	256
Shop Hints	326
Available Literature	337
Advertiser's Products Index	376
index to Advertisers	382

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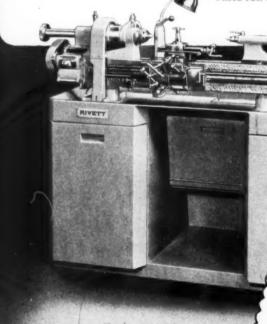
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JULY, 1947

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Featured in this issue		
Hole Location Methods By Frederick C. Victory	Featured in this issue	131
By Frederick C. Victory Operation of an Engine Lathe	As the Editor Sees it	133
New Plug Gage Simplifies Gaging Operation		137
Liquid Power 18 Letter from England 20 Precision Measurement 21 By Warren Baker 21 Large Overseas Attendance Expected at National Machine Tool Show 22 Chicago—Crossroads of America 240 By H. L. Purdy A Short History of the Machine Tool Industry 247 By Wm. F. Schleicher 256 What's New in Metalworking 256 Shop Hints 326 News of the Industry 331 Available Literature 337 New Technical Books 342 This Month's Industrial Films 346 Mechanics Through the Ages 372 Products Index 376	Operation of an Engine Lathe	151
Letter from England	New Plug Gage Simplifies Gaging Operation	174
Precision Measurement By Warren Baker Large Overseas Attendance Expected at National Machine Tool Show 22' Chicago—Crossroads of America	Liquid Power	189
By Warren Baker Large Overseas Attendance Expected at National Machine Tool Show 22' Chicago—Crossroads of America 240 By H. L. Purdy 247 A Short History of the Machine Tool Industry 247 By Wm. F. Schleicher 255 What's New in Metalworking 256 Shop Hints 326 News of the Industry 331 Available Literature 337 New Technical Books 342 This Month's Industrial Films 346 Mechanics Through the Ages 372 Products Index 376	Letter from England	202
Machine Tool Show 22' Chicago—Crossroads of America 240' By H. L. Purdy A Short History of the Machine Tool Industry 247' By Wm. F. Schleicher 256' What's New in Metalworking 256' Shop Hints 326' News of the Industry 33' Available Literature 33' New Technical Books 342' This Month's Industrial Films 346' Mechanics Through the Ages 372' Products Index 376'		212
Chicago—Crossroads of America 240 By H. L. Purdy A Short History of the Machine Tool Industry 247 By Wm. F. Schleicher 248 What's New in Metalworking 256 Shop Hints 326 News of the Industry 331 Available Literature 337 New Technical Books 342 This Month's Industrial Films 346 Mechanics Through the Ages 372 Products Index 376	Large Overseas Attendance Expected at National	
By H. L. Purdy A Short History of the Machine Tool Industry		
By Wm. F. Schleicher What's New in Metalworking 256 Shop Hints 326 News of the Industry 331 Available Literature 337 New Technical Books 342 This Month's Industrial Films 346 Mechanics Through the Ages 372 Products Index 376	Chicago—Crossroads of America	240
Shop Hints 326 News of the Industry 331 Available Literature 337 New Technical Books 342 This Month's Industrial Films 346 Mechanics Through the Ages 372 Products Index 376		247
News of the Industry 331 Available Literature 337 New Technical Books 342 This Month's Industrial Films 346 Mechanics Through the Ages 372 Products Index 376	What's New in Metalworking	256
Available Literature 337 New Technical Books 342 This Month's Industrial Films 346 Mechanics Through the Ages 372 Products Index 376	Shop Hints	326
Available Literature 337 New Technical Books 342 This Month's Industrial Films 346 Mechanics Through the Ages 372 Products Index 376	News of the Industry	331
This Month's Industrial Films 346 Mechanics Through the Ages 372 Products Index 376		
Mechanics Through the Ages	New Technical Books	342
Products Index376	This Month's Industrial Films	346
	Mechanics Through the Ages	372
Index to Advertisers382		
	Index to Advertisers	382

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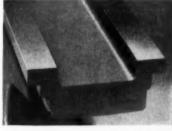
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Above: Bed and Headstock arecast integrally to form an extremely heavy unit and to provide the rigid foundation for all types of work.

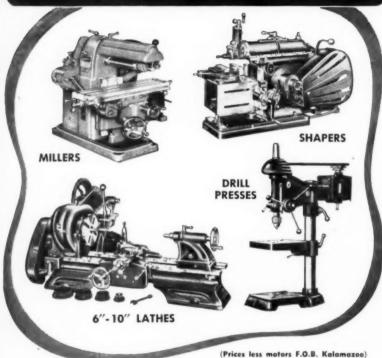
Below: Solid block type ways are straddle keyed to the bed and ground in perfect alignment with the spindle. All working surfaces are bardened to 64-66 Rockwell "C".





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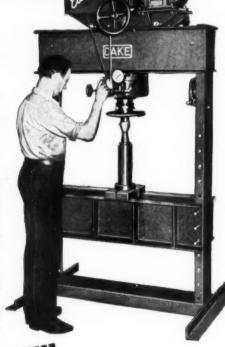
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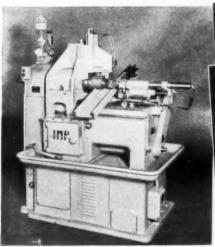
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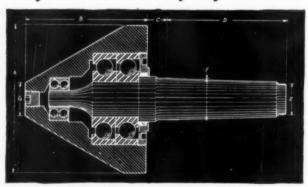
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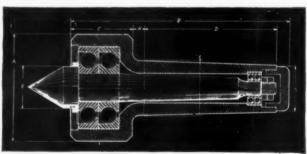
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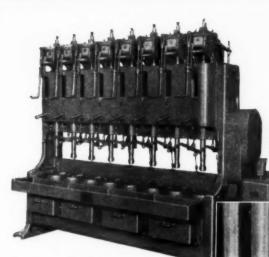
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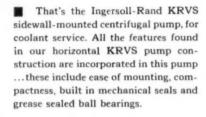
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If you are considering a new pumping unit or the replacement of your present one, be sure to specify Ingersoll-Rand. Your nearest I-R branch office or your local I-R distributor can give you complete details.

Ingersoll-Rand



NEW Mohawk "lifetime" counterbore with blades that can be sharpened without waste for its entire length and integral, subland, precision, radialground pilot extending the entire length of the flute. Just sharpen the end of the blades-the pre-ground sub-land grows a new pilot for you. You never have to cut off useful tool life to re-establish a pilot. Write for sizes and prices on stock numbers to Mohawk Tool Company. 21647 Dequindre Road. Hazel Park, Michigan.

Mohawh Sub Lands

-MODERNIZATION

with

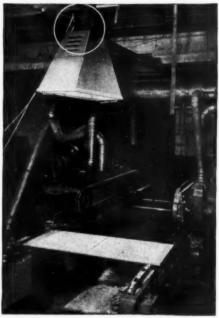
CARTER Guide-Line LIGHTS

- Brilliant WHITE Lights that throw a SHARP, BLACK Shadow GUIDE-LINE

For Use On:

- Rip Saws
- Tandem Saws
- Double-End Tenoners
- Veneer Matching Tables





With increased labor and material costs, Modernization of productive operations is the key to low-cost output. Carter Guide-Line Lights with tilting attachment enable you to increase and improve your productive output on cutting operations by providing a shadow Guide-Line which just shaves the stock to be cut.

Write today for FREE complete information on this modern, tested, time-saving equipment.

CARTER PRODUCTS COMPANY

960 Michigan Trust Building

Grand Rapids 2, Michigan



It is reported that

Goodyear Tire & Rubber Co. are making a 30-foot rubber electric heating pad to dry the inks used in printing textile fabrics.

get ready with CONE for tomorrow

Farnsworth Television & Radio Corporation has the "Utiliscope", a television set that shows, in any room, a continuous picture of operations in a remote, inancessible or dangerous part of a plant.

be ready with CONE for today

The Moore School of Engineering of U of P is building an electronic computor. —It is reported that this new machine is faster than the famous ENIAC, will remember fifty times as many numbers and uses only 3,000 tubes, instead of 18,000.

get roady with CONE for tomorrow

The new Blaw-Knox equipment pulverizes coal by self-abrasion in a blast of super-heated steam.

be ready with CONE for today

The Marmon-Herrington 44passenger trolley bus uses light metals to reduce weight to 17,230 pounds.

get ready with CONE for temorrow

General Electric Company has two steam turbine generators under construction for electric power companies. These will use steam at 2,000 pounds pressure and 1,050 degrees and develop 125,000 kilowatts.

be ready with CONE for today

Western Pine Association hopes to cut lumber drying time to 4 hours by the use of acetone spray.

Flaw-free 90° creases can now be formed in thermoplastic sheet of .005" to .020" thickness up to 30" wide on a repetitively uniform, high-speed production basis with a newly designed machine incorporating thermostatically controlled "instant-crease" action developed by the Sheet Plastics Equipment Division of Taber Instrument Corporation. Dow Latex 512 is offered as an immediately available substitute for linseed and other vegetable oils.

In a new method of bridge building, developed at the University of Illinois, the concrete roadway is rigidly connected to the steel structure. This "composite construction" is said to save 30% in the weight of steel beams used.

be ready with GONE for today

Shell Chemical Co. has plans for the commercial production of glycerin from petroleum in 1948.

National Carbon Co. claims that its new flashlight cell has double the capacity of previous cells due to improved chemical mixture. The first machine tool show sponsored by the National Machine Tool Builders' Association since 1935 will be held in the Dodge-Chicago plant, Sept. 17-26.

be ready with CONE for today

Improvements and innovations in multiple spindle automatic bar machine design will be represented by the new models on display at the Cone Automatic Machine Co. booth at the Chicago Machine Tool Show.

get road; with CONE for tomorran

Link-Belt Company's Electrofluid Drive is a combination of electric motor and the familiar "fluid flywheel". It reduces the starting load, cushions shocks and prevents damage from overload.

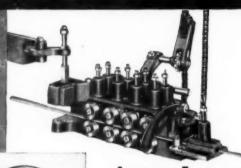
he ready with EUNE for today

Experimental work on a process for forming cold bonderized sheet steel under pressures as high as 230,000 psi is being conducted by Heintz Manufacturing Co. of Philadelphia. If successful, the process may greatly reduce the cost of many common steel articles.

FOLLOW THESE PAGES FOR NEWS OF PROGRESSIVE PRODUCTION



WITTEK Automatic ROLL FEEDS AND REEL STANDS For All Types of Punch Presses





Assures Fast and Accurate Feeding of Coiled Strip Stock

Wittek-Automatic Roll Feeds provide maximum efficiency in the high speed automatic feeding of all types of coiled strip stock to punch presses. Highly flexible in function and application, they are capable of feeding lengths up to 24" per stroke of the press and will handle various stock thicknesses in widths up to the maximum width of the rollers.

Wittek Adjustable Reel Stands provide automatically expanding coil holders that center the coil and assure maximum production by eliminating looping, tangling and back lash of stock. If your production problem involves feeding coiled stock to punch presses, consult us. Your inquiry will be given immediate attention. Ask for completely descriptive catalog.

WITTEK Manufacturing Co. 4305-15 W. 24th Place, Chicago 23, Illinois Automatic
ROLL FEEDS WAS
AND
REEL STANDS

TWO OLIVER MACHINES

Use the Oliver in your own plant. TO CUT COSTS in DIE MAKING



Extremely accurate for sawing, filing, and lapping tool steels up to I" thick 81/2" throat permits working to center of 17" circle . . 10" table tilts 10 degrees right, left, and forward.

> OLIVER OF ADRIAN PRODUCTS



This machine will saw and file metals up to 3" thick. Sawing can be handled up to 20" circle. 100 to 300 strokes. The 14" table tilts 15 degrees to front, left or right and 3 degrees to back. Constant controlled pressure feed. NO WORK SPOILAGE.

The Oliver of Adrian Die Making Machine cuts direct labor cost 50% to 60% in making dies, gages, templates and cams. Does not require skilled mechanics to operate.

IMPROVE YOUR TOOLROOM IT'S THE BACKBONE OF PRODUCTION OLIVER INSTRUMENT CO. 1408 E. MAUMEE ST. ADRIAN, MICH.

Send for illustrated literature.

AUTOMATIC DRILL GRINDERS TOOL & CUTTER GRINDERS - DRILL POINT THINNERS - TEMPLATE TOOL GRINDERS-FACE MILL GRINDERS-DIEMAKING MACHINES

TURNING TURNING TOOL . . . Replaces 14 TOOLS



You can change R and L tools from right to left or vice versa in 10 seconds and it is the only tool of its kind on the market. No time, is wasted in set-up. R and L performs several simultaneous operations such as turning shoulder concentric with stock diameter; turning two diameters while drilling or reaming; turning one diameter—chamfering two corners, facing end of part along with drilling or reaming; turning and forming special shape on end of part while drilling or reaming; drilling and chamfering; pointing work concentric with diameter.

You can save in first cost as well as production by using R and L Tools.

Let us send you detailed information. Delivery from stock.

RIGHT to LEFT

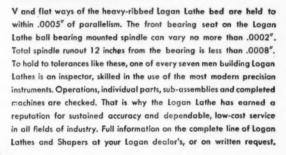
RAND L TOOLS

1825 BRISTOL ST., NICETOWN, PHILADELPHIA 40, PA.



PRECISION BUILDING

GIVES LOGAN LATHES SUSTAINED ACCURACY AND LASTING DEPENDABILITY



SPECIFICATIONS COMMON TO ALL LOGAN LATHES . . . swing over bed, 101/2"... bed length, 431/4"... size of hole through spindle, 25/32"... spindle nose digmeter and threads per inch, 11/2"-8...12 spindle speeds, 30 to 1450 rpm ... motor, 1/2 hp, 1750 rpm ... ball bearing spindle mounting ... drum type reversing motor switch and cord... precision-ground ways, 2 V-ways and 2 flat ways.

DISTRICT OFFICES:

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550 W. WASHINGTON BLVD. 1672 MISSION STREET CHICAGO 6, ILLINOIS CENTRAL 1246.

SAN FRANCISCO, CALIF. UNDERHILL 6682

LOGAN ENGINEERING CO. CHICAGO 30, ILLINOIS

32 ALUNDUM...



32 ALUNDUM abrasive is entirely new—entirely different from any other aluminum oxide abrasive. Made by a unique electric furnace process, its grains are sharper and of higher purity.

We expected 32 ALUNDUM abrasive to make a real hit but it has been even more successful than anticipated. From plants everywhere are coming outstanding reports—some of them truly sensational—on the ability of 32 ALUNDUM wheels to lower grinding costs by . . .

1. cutting faster

2. cutting cooler

3. requiring fewer dressings

4. lasting longer

If you are not already using 32 ALUNDUM grinding wheels, it will pay you to get in touch with your Norton abrasive engineer or Norton distributor at once.

NORTON COMPANY . WORCESTER 6, MASS.

Distributors in All Principal Cities



No crushing to size is necessary with 32 ALUNDUM abrasive. The grains form as individual crystals — pointed on all sides. No matter how they are bonded into a wheel one or more cutting points are exposed.

OR SPEED, POWER, AND ACCURACY

15 GO ... from the word GO!

WORLD'S MOST COMPLETE DRILL PRESS LINE

8 - 12 SPEED MOTOR SPINDLE RADIAL DRILL



3/4" capacity with 3 ft., 4 ft., and 5 arm. Simply designed, easy to operate, for close precision work. Powerld by 2 h.p. constant horsepower mer, magnetically controlled, 1200 RPM at 1800 RPM. 4 rates of power feed. stomatic trip. Ideal for tapping.



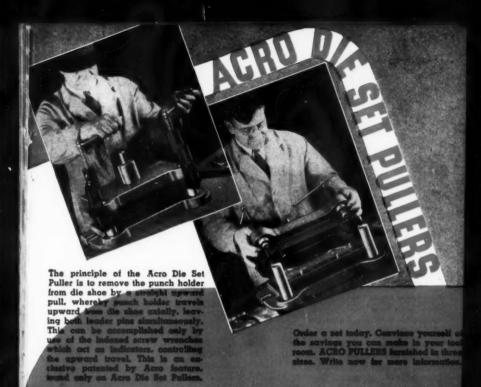
21" BOX COLUMN SLIDING HEAD FLOOR DRILL

1-1/2" capacity, available in 1-, 2-, 3-, 4- and 6-spindle models, of full ball and Timken roller bearing design. Eight step Vee belt drive on famous C-O tilting motor bracket gives sixteen spindle speeds. Positive geared power feed. Automatic stop. Also operates through lever, power feed or worm wheel feed. Accurately machined column, base and adjustable table.



CANEDY-OTTO MFG. CO. CHICAGO HEIGHTS, ILLINOIS

Builders of the World's Most Complete Drill Press Line
— radial drills, sensitive drills, upright drills, hi-speed
drills and special drilling machinery.



Dual visibility — Sight glass on side of inbricator bowl an exclusive SUPER feature, shows exact oil level maintained in bearing plus oil supply in reserveir, eliminating quees work.

There is no drippage, no waste, no ever flow. Oil is automatically ted to the bourings as required.

Nationally known authorities estimate that 75 per cent of all machinery repairs as caused by inefficient and improper lustration, and that 85 per cent of the all bounds for lubricating purposes is never used by the bearing surface for which it was intended. WRITE FOR LITERATURE.

SUPER LUBRICATOR.



ACRO

PROMPT

METAL STAMPING COMPANY: 332 E. RESERVOIR AVENUE MILWAUKEE 12, WISCONSIN

SUNNEN PRECISION HONING

Finishes Internal Diameters on

Valve Parts Quickly and Accurately-
Lengthens Life of Valves

These photographs show typical valves and valve parts an which Sunnen Precision Honing saves time, produces base metal finishes, and straight round holes free of bellmouth and taper. This means that a honed valve can be fit closer, will wear longer and seal better ... right up to the edge of a port.

The Sunnen Precision Honing Machine is versatile — handles every internal diameter from 1.20° to 2.625° in any metal, plastic, glass or ceramic material, except lead and babbitt. New sizes are accommodated by small investment in new mandrels.



Straight round holes are produced on this part for Jeffrey Mfg. Co., Columbus, Ohio — in spite of the irregular parts and lands.



Gyroscope balance valve body
"saves production time in getting
closer limits of accuracy."

The sizing control on the Sunnen Precision Honing Machine permits removing as little as .0001°, to produce a perfect fit. Maintains previously established alignment — duplicates sizes easily — requires no jigs or fixtures — can be set up ready to operate in one minute.

For additional information, write for bulletin XMAN-5000, or ask a Sunnen engineer to show you how Sunnen honing can be used in your plant.



SUNNEN PRODUCTS CO.

7935 Manchester Ave., St. Louis 17, Missouri Canadian Factory: Chatham, Ontario



Branze valve. The Sunnen Precision Hone is used to secure high finish and accuracy.



Saved time in producing a smooth accurate finish on this branza remate control valve leady.



Smooth accurate finish is produced on this branze oil burner valve part with .001" to .002" stack removal.



Removing .002" of stack from this branze carburetor valve produces a straight round hole accurate within .0001".



A minimum of 70% bearing surface is produced on this hardened steel valve guide bushing. Reamer marks are removed—talerance limits .0003".

MICROMETER ADJUSTMENT ELIMINATES "GUESS WORK"

Biltmore

- 1 Can be fitted to any Turret Lathe.
- 2 Requires only about 10 Seconds to "set" Cutter for each new cut.
- Cutter will take sharper edge.
- 4 Cutter will last 60% longer.
- 5 Dial control also serves as "tool release" on backing off.

SINGLE CUTTER ADJUSTABLE TOOL HOLDER

A turn of the Adjustment Dial one graduation moves the Cutter exactly 1/1000th of an inch, and instantly locks in place. Speed and accuracy control maintained. The Cutter is nearly in a vertical position. The cutting edge is "with" the END GRAIN of the steel, therefore, your Cutter will take a sharper edge, and last 60% longer.

The Dial screw is on the fixed base plate. It actuates the cutter plate, which moves on a pivot.

Turn the dial clock-wise to set Cutter "in".

Turn the dial counterclock-wise on backing

Size B ¼" to 1½". Immediately Available.
Dealers: Some territories still open.



HOUSE OF COMMERCE

905 HAMMOND BUILDING

DETROIT 26, MICHIGAN

Now-a real heavy duty JUMBO CLAMP

It is the only big clamp we know of that provides for spindle adjustment along the toggle bar.

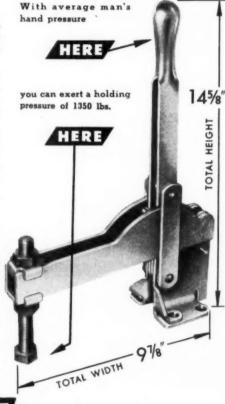
It has a special designed base having an ingenious, integral front corner and back support, making deflection at spindle, therefore, only 5/32".

Each clamp comes equipped with an adjustable spindle assembly. However, this can be removed and a special pressure pad to suit your requirements can easily be substituted.

The clamp, catalogued as V-1100, has comfortable hand grip. Weighs 6 lbs.

The recommended pressure is 1350 lbs.

As exclusive manufacturers of clamping devices, we do encounter a wide variety of clamping problems. You will find it very advantageous to draw on this extensive experience. Write for catalog showing the full Knu-Vise line of clamping devices.





2207 Eighth St., Detroit 16, Michigan 422 Magnolia Ave., Glendale 4, California



positive protection against rust and corrosion while tool is idle.

Easy to install in any airline. Automatic. Operates only while tool runs. Sight feed ends guessing.

Act now! Install Norgren Lubricators—the best air tool protection money can buy! Write for catalog No. 400. C. A. Norgren Co., 222 Santa Fe Drive, Denver 9, Colorado





EXTRA VALUES

- 1. Reversible-for 2-times service life.
- 2. Extra Long-for 6-times service life.
- 3. Truncated thread set plugs.
- 4. Root relief on all thread rings' major diameter at no extra cost.
- 5. Chrome Salvage.

Send for Catalog 47 for complete information.

CENTERLESS LAPPING SUPER FINISHES



Size Control's new Centerless Lapping Machine gives a precision finish of less than 2 micro inches to cylinno special operating skill-piece is simply placed between lapping rolls. No costly set-ups or special tools -handles diameters from .010" to 10.00" with speedy adjustment of roller spacing. Send for Catalog 47.

Buy one Size Control Steel Reversible Plug Gage—it keeps serving while 6 old type, taper-lock steel gages wear out. Extra long plugs reverse in positive-locking, pin-vise handle for double service-you can cut off worn tips for up to 6 times service. Reduce wear tolerances - cut rejects; speed up inspection.

For even longer service - one chrome Reversible gives 10 times service of unchromed, old type, taper-lock gage at only 11/2 times drical parts, Requires cost. Carbide Plain Reversible, up to .375", gives 100 times service at only 2 times cost. Norbide, up to .375", gives 200 times service at only 3 times cost, PLUS—substantial allowance on worn or surplus gages toward chrome, carbide or norbide Reversibles.

MAKERS OF PLAIN, THREADED, AND TWIN PLUG GAGES . . . THREAD RINGS, SNAPS THREAD, GEAR, AND SPLINE WIRES ... PIN AND DRILL GAGE SETS, FRACTIONAL SETS 2510 W. Washington Blvd., Chicago 12, III. Phone: Monroe 6710

DIVISION OF

AMERICAN GAGE & MACHINE COMPANY

SIZE CONTROL CO. Precision

WALSH PRESS AND DIE CO. Punch Presses

WACKER SALES, Affiliate Precision Inspection Equipment

Engineering Representatives in Principal Cities

PROSSER Carbide Grinders





For fast, efficient rough grinding and fine finishing of carbides, stellite, high speed steel, and other modern tools, install Prosser Carbide Grinders. Their rugged construction, modern design, and ease of operation insure long, dependable and profitable service.

Prosser Carbide Grinders are built in bench and floor models of several capacities, for wet or dry grinding. Attachments for chip breaker and drill grinding.

Important features include:

- · Quick-acting indexing tables.
- Adequate wet-grinding equipment.
- High grade ball bearing spindles.
 Oversize wheels, giving longer wheel life, and permitting grinding of larger tools.
- Moderate price.
- Prompt deliveries.

Write for details

Thomas Prosser & Son
120 WALL STREET . NEW YORK S. N. Y.



CULLMAN Stock SPROCKETS

will do the job-Better!

With 2,000 types to select from—you are almost certain to find just the size you need for practically every transmission requirement—ready for immediate delivery. Cullman Sprockets—produced by fast, low-cost, high-precision methods—assure top operating efficiency. "Specials," too, are quickly available—made up by exclusive Cullman methods and specialized equipment.

CULLMAN WHEEL COMPANY

1350-W Altgeld Street

Chicago 14, Illinois



s to be of

SIMONDS

"RED STREAK" Precision-Finished

FLAT GROUND STOCK

MAKE YOUR OWN GAUGES, dies, jigs, templates, stamps, shims, machine parts and small tools... with Simonds Oil Hardening Flat Stock, made of Simonds own alloy tool steel, uniformly annealed for easy machining and proper hardening.

SAVE TIME AND MONEY with this Flat Stock which is cut to 18" length and accurately ground to standard thicknesses and widths. No need for the expensive machining required to grind ordinary stock to size.

145 STOCK SIZES . . . special sizes to order. Get "Red Streak" Flat Ground Stock from your Simonds distributor, or the nearest Simonds office. Immediate delivery from stock.



SAW AND STEEL CO.

FITCHBURG, MASS.

Other Divisions of SIMONDS SAW AND STEEL CO.
making Quality Products for Industry

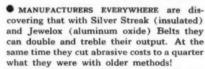
SIMONDS

BRANCH OFFICES: 1350 Columbia Road, Boson 27, Mass.; 127 S. Green Su., Chicago 7, Ill.; 416 W. Eighth St., Loa Angeles 14, Calif.; 228 First St., Sas Francisco S, Calif.; 231 S. W. First Avenue, Portland 4, One.; 31 W. Trent Ave., Spokase 8, Wash. Consider Persone; 393 St. Remi St., Montreal 30, Que.

In Counts

Furnace Steels





And both of these belts are finished by the Velvet Joint process. They lie smooth, never jump or bump... both have the quality features that mark all Jewel Abrasives.

Try a belt! See for yourself! Immediate delivery on most sizes. Phone your jobber or write to Abrasive Products, Inc., 527 Pearl Street, South Braintree, Mass.



MORE PRODUCTION

FROM YOUR HIGH SPEED STEEL CUTTERS

Get maximum production from your molybdenum, tungsten and cobalt high speed steel cutting tools by hardening them the Sentry way. Sentry Electric Furnaces are quick heating, clean, economical.

Sentry Furnaces employ the Sentry Diamond Block method of scientific atmospheric control for maximum hardness and uniform quality. The Diamond Block method produces scale-free, dimensionally correct work, is fully automatic and requires no special skill to operate.

There is a Sentry Furnace to exactly meet your requirements. Write for bulletin 1054-D3

Sentry No. 2 Model Y Electric Furnace.



The Sentry Company
FOXBORO, MASS., U.S.A.



EDLUND

DRILLING and TAPPING MACHINES

The No. 2 Motor Spindle Drilling and Tapping Machine is built by Edlund for heavy production or tool room use. The upper frames are sturdy one-piece castings with hand scraped bearings for the sliding arm; the base is a heavy, well-ribbed casting with planed and hand-scraped ways for the table bearing. The motors are solidly mounted to eliminate vibration. With this construction, deflection is reduced to a minimum . assuring long life and accurate service.

The three spindles on left, side are hand feed, fourth spindle has reversing motor tapper; 12" overhang. Four spindle speeds without back gears or eight speeds with back gears are provided. Power feed and many other desirable features are available.



Write for Bulletin No. 107 for full particulars about Edlund Drilling and Tapping Machines

EDLUND MACHINERY CO. INC., CORTLAND 3, N. Y.



mous Line that has consistently brought you-Mechanics Hand Tools that Make Money.

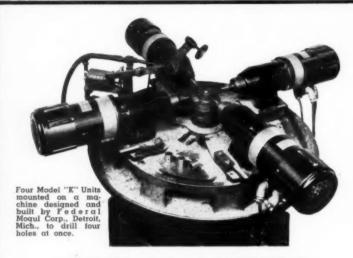
Note the remarkably slim, new OVAL design . . . it's streamlined, yet strength has actually been increased . . . clumsy bulk of the old round shape has been scientifically eliminated and steel added in the direction of strain. The new oval grip, too, is beautifully designed to fit the hand more securely.

Stronger, slimmer-amazingly effective in the tough spots-that's the story on the whole New Britain Line today!

Excess material, top and bottom, in old round shape, did little or no work. Removing this surplus greatly reduces useless bulk. Slight reinforcement added to each side in new Oval design-in direction of push and pull-develops amazing new strength.

There's knuckle and job insurance in these really modern Tools of Greater

Strength-Better Fit . . . ask your Mill Supply Jobber to show you the Line. The New Britain Machine Co., New Britain, Conn.



HOW TO REDUCE LABOR COSTS!

USERS of Govro-Nelson Automatic Drilling Units are our authority for the somewhat startling statement that multiple drilling with our units has usually resulted in stepping up the production rate from 4 to 10 times, with a corresponding decrease in man-power.

For example, in one Govro-Nelson installation, the present output of one operator is greater than the former output of three.

Send for literature showing the possibilities of Govro-Nelson Units from the standpoint of reducing labor costs.



GOVRO-NELSON Co. 1933 Antoinette

1933 Antoinette Detroit 8, Mich.

Automatic DRILLING UNIT



CENTRIFUGAL COOLANT PUMPS

THE ACTION SPEAKS FOR ITSELF

FEW WORDS ARE GOOD, TOO

"They have been giving satisfactory, trouble-free service"
... wrote Perfect Circle who use these pumps in their Hagerstown, Ind. plant.

Cutting Tools and Work Surfaces Are Held to Proper Temperatures.

FULFLO COOLANT PUMPS bring the coolants as specified for the particular job direct to the proper objectives.

Standard or special models. Pipe sizes 3/8" to 11/2".



Write on your letterhead for FULFLO MECHANICAL DATA BOOK



Specialties Co., Inc.



5¾" x 13"

\$47.65 61/4" × 18"

\$63,15

8" x 24"

\$109.30

10%" x 37"

\$202.05





RECTIFIERS

For converting A.C. into D.C. for use on magnetic shucks. A.C. input 110 value. D.C. output 110 valts, 0.5 emps. de for use with L-W 3%" x 13" and 6%" x 18" magnetic chucks. For continuous duty and long life. Larger capacity recti- \$38.75

DEMAGNETIZERS

A single pass over the stationary pales is sufficient to comp agnetize work that has become magnetized through induction Model 8-2 for large work, complete with pilot light signal, switch and cord. Operatos on 110 volts A.C. corrent. 7%" wide. \$53.20

Madel J-1 for small work, complete with switch and cord. \$41.15 7½" wide, 7½" long, 6½" high. Shipping weight 25 lbs. \$41.15

DEMAGNETIZING SWITCHES



for use on our 5%" x 13" and Albi's 18" sizes. When the switch is thrown to "ON" assition, the churk is magnetized, and the work hold firmly for grinding. When the work is to be released, the switch is thrown to "DEMAG" and contacts are touched momentarily \$8.90 to neutralize the chuck.

Field discharge type for \$16.25

Send for complete catalog giving prices and specifications on these quality, low-cost L-W Products



23 SO. ST. CLAIR ST. TOLEDO 4, OHIO

Tool Maintenall Come Down



WHEN YOU USE Universal Cutter Grinder

Tool Maintenance Costs Come Down when you use a "Knock-Out" Universal Cutter Grinder.

Set-ups are simpler, easier to make—less time is lest between jobs—more tools of all types can be properly reconditioned at less cost with a "Knock-Out" Universal Cutter Grinder. Handles internal, external and surface grinding too. A"Knock-Out" Universal Cutter Grinder is the busiest machine in any Tool Room.

Ask your "Knock-Out" dealer for



ABERDEEN, SO. DAK.

OFACTURERS OF MACHINE FOOLS AND AUTOMOTIVE MAINTENANCE EQUIPMENT

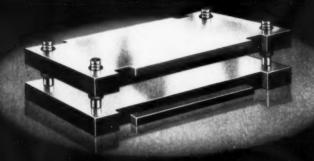


K. G. LEE COMPANY 1113 First Ave. S. E. Air Please send us complete details on ak-Out" Universal Cultur Set

NAME.

ADDRESS. CITY_ STATE

Finely Made Special Die Sets



CALL "DETROIT"

We are well qualified by experience and well equipped mechanically to produce special die sets of the highest quality. Send us your prints or call the "Detroit" man in your area. We also supply standard die sets in all sizes, and all kinds of accessories. DETROIT DIE SET CORPORATION
2895 W. GRAND BLVD. - DETROIT 2, MICHIGAN

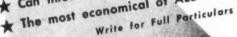






the Standard COULTER "HT" Thread Milling Machine IS THE MACHINE FOR YOU!

- * Any number of Lands eccentric or con-eccentric relief can be produced. Dies from 3/8" up to 2"
- ★ Equipped to give cutter speeds with infinite changes
- * Can thread round, square and inserted chaser dies
 - ★ The most economical of ALL threading machines







The James COULTER Machine Co. BRIDGEPORT U.S.A. Danly Die Sets and Die Makers' Supplies Speed Production

in the Die Shop



DANLY PRECISION DOWEL

PINS are accurate through their entire length . . . Diamond tested for hardness 58-60 Rockwell-Ci Ground to a tolerance of .0001".



Photo-Courtesy of Croname, Inc.



SOCKET-HEAD CAP SCREWS save time and money. The mechanic candrive the knurled head a good part of the way before using the wrench. Infinite applications -a wide range of sizes.



DANLY KWIK-KLAMP TOGGLE CLAMPS combine strong construction and simplicity of operation-used wherever quick, positive clumping action is required.



DANLY DIE SPRINGS are noted for staying power

and high resistance to fatigue. Two complete lines: Medium Pressure -High Deflection; High Pressure-Medium Deflection.



DANLY SOCKET-HEAD STRIPPER BOLTS. Made of high-grade

steel, these stripper bolts have the same knurled socket-head found in Danly Cap Screws.



DANLY DIE SETS are famed for precision and known accuracy in Die Shops and Stamping Plants everywhere. Many types and sizes in Steel, and Sen -Steel.

DANLY MACHINE SPECIALTIES, INC.

2100 South 52nd Avenue - Chicago 50, Illinois



DUCOMMUM METALS & SUPPLY CO

Danly Tool. Die and Gage Makers' Supplies



PRECISION
SPECIAL
Ground Thread Taps

PROMPT DELIVERY

Many special as well as standard taps in stock. Send for catalog on company letterhead. HY-PRO Ground Thread Taps are today's watchword for economy. Accurately tapping six times as many holes as a cut thread tap at high speeds, these rugged precision tools require only about one-fifth the sharpening for the same number of holes, and are less easily broken.

Save time! Save costs! Effect definite savings and increase production by specifying HY-PRO Ground Thread Taps for every tapping job. You'll find they will stay on the job longer, maintain their size longer, and produce at a profit. HY-PRO...High Production at Low Cost.

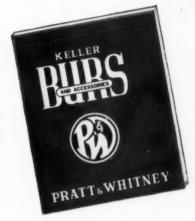
For High Production



New Bedford, Mass, U. S. A.

The RIGHT BUR for each job

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The new P&W Keller Bur Catalog describes and illustrates a wide range of dependable, smooth-running, long-lived Keller burs and other accessories. These tools are engineered for high efficiency performance.

This new catalog will suggest many profitable uses. Send for your copy today. It will show you how Pratt & Whitney burs, when run at correct speeds and under proper conditions, will pay you substantial dividends.



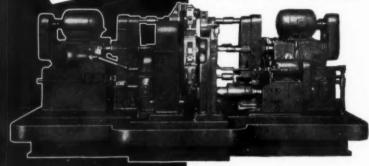
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Avey Automatic METHOD No. 5

THE **Avey**CAM FEED UNIT

No. 1 Size - 1/2" capacity in cast iron.

No. 2 Size - 7/8" capacity in cast iron.



Accelerated production obtainable by free loading time and automatic ejection of work. Fatigue element lessened by automatic indexing.

OPERATION

METHOD No. 5 — lower cost per part, completed double end work at one clamping — [no relocation] — greater accuracy, enabling semi-skilled operators to deliver high quality production speedily, accurately, efficiently, with a minimum of supervision. designed for multiple operations on individual parts— (double end at one clamping of work)—facing, drilling, reaming and tapping.

Send for Engineering Bulletin 645

THE AVEY DRILLING MACHINE CO.









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For holding any magnetic material at any angle, single or compound, quickly and securely, but without distortion. The part is held and released instantly by the turn of a switch. There is no pressure to cause slippage. The angle is set by gage blocks and this, combined with the accurate, sturdy construction of the Magna-Sine itself, assures a precision set-up.

The Magna-Sine will save hours on every type of angular set-up. Use it for grinding, milling, drilling, boring or any other operation where the work must be held rigidly and accurately at any angle.

The Robbins Sine Plate

is made on the same principle and with the same sturdy precision as the Magna-Sine, but it is non-magnetic. It is an extremely useful tool for inspection, jig boring and many other operations.

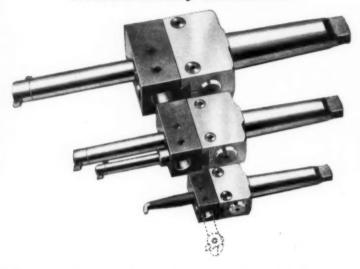
Robbins Engineering Company, 318
Midland Ave., Detroit 3, Michigan.



PRODUCERS OF ROBBINS MAGNA-SINE . ROBBINS UNIV-ANGLE ROBBINS SINE PLATE . ROBBINS INDEX TABLES ROBBINS No. 3 DRILLMATIC . SPECIAL MACHINERY

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Unconditionally Guaranteed



THIS popular line of Tools has been the standard for precision boring for a great many years. Always high quality at low prices.

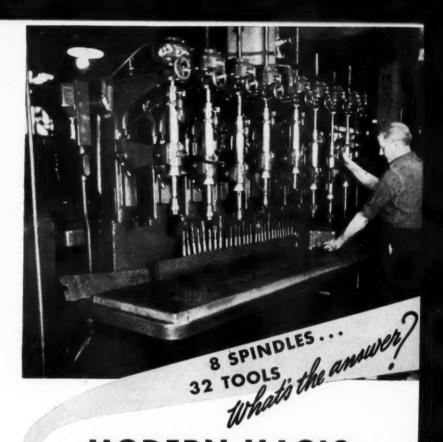
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The above set-up is a typical example of what can be done with MODERN Magic Quick Change Chuck and Collet equipment. Here, four spindles of the machine, equipped with MODERN Magic Chucks, perform twenty-eight separate operations.

The twenty-eight tools are easily and quickly changed without stopping or even slowing the machine. Bulletin M-101 gives complete details on MODERN Magic Quick Change Chuck and Collet equipment. Send for your copy today.

PROMPT SHIPMENT..... USUALLY MADE FROM STOCK

MODERN TOOL WORKS

CONSOLIDATED MACHINE TOOL CORPORATION
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NUPLA MALLETS with

Interchangeable Tips

- Will not mar or damage delicate painted, polished or plated surfaces.
- 2. No sting, vibration or rebound,
- 3. Will not "gash", mushroom or chip.
- 4. Not affected by oil or gasoline.
- They are safety mallets—No explosion or fire hazard.

Equipped with NUPLOCK (Pat. Pending)—a dependable Tip-Locking device.



Nupla Mallets are made of a time tested material which gives them toughness, resiliency and self-healing qualities no other mallet possesses.

When ordering state grade ("S"-Soft "M"-Medium "T" Tough)

						C	OMPI	ETE	NUPLA	MA	\L	LET	S				
Mailet No.		ad ia.	w	pht.	Head Length		Price Each	Min		o.	Hei		We	ht.	Head Length	Price Each	Min. Pkg.
100	8	89	5	Oz.	31/2"		2.00	6	250	1 2	29/9	00	2	Lb.	53/4"	6.50	4
105		100	8	Oz.	31/2"		2.50	6	253		21/2	.00	4	Lb.	53/4"	7.50	4
150	19	2 20	36	Lb.	436"		3.00	6	300) :	3	0.0	31/2	Lb.	61/2"	10.00	2
155	10	3 ***	89/4	Lb.	4%"		3.25	6	305	3	3	60	6	Lb.	61/2"	11.00	2
200	2	49'	15/4	Lb.	41/2"		4.00	6	307	3	3	60	9	Lb.	61/2"	16.00	1
205	2	09	2	Lb.	41/2"		4.50	6	308	3	3	80	12	Lb.	61/200	18.00	1
207	2	00	3	Lb.	41/2"		5.25	4									
					Extra	Tips	May	Be	Obtaine	d fo	X	Replacement			S		

ROTARY TABLES Useful Shop Tools

These Universal Rotary Tables often take the place of costly fixtures. They are used for a variety of work on milling machines, shapers, drill presses and horizontal boring mills.



Model BH-12



Prompt Delivery

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See for yourself how Truarc slashes assembly time, cuts costs





2 MINUTES vs. 2 SECONDS!

Right before your eyes is visual proof of how much assembly time can be cut. Each of the many light streaks in the first photo traces another time-taking arm motion. In the second photo, one Waldes Truarc Retaining Ring replaces six screws and a collar. The assembler uses one tool—a pair of Truarc pliers. Less time is required for job-training, because Truarc guarantees accurate relationship of parts regardless of the skill of the assembler. Truarc means lighter weight, less bulk. Production and

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There are different Truarc rings for different applications: see what can be done for your product. Send your drawing to Waldes Truarc Technical Service Engineers for individual attention, without obligation. To get a copy of "New Development in Retaining Rings," write to Dent. 22-Q





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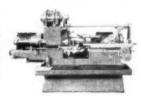
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WE'VE MOVED. The *Cleveland Automatic Machine Company now has a new home. To gain enlarged and modern plant facilities, our main factory and offices have been re-located in Cincinnati. Shown above is our new plant.

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Cleveland Automatic Model B-18" Shaft Machine. For automatic, economical production of multiple diameter shafts, spindles, studs, bolts, etc.



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- Furnished with high speed steel, cast-alloy or Tungsten Carbide tipped blades.
- · Interchangeable pilots.
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- All tools have heat treated alloy steel bodies with ground thread for extreme accuracy.



Another production increaser

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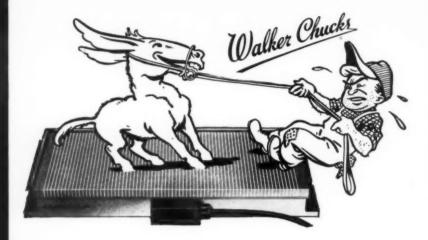
Facing and Counterboring Tool

GENESEE MFG. CO., INC.

ADJUSTABLE MOLLOW MILLS • FACING AND COUNTERBORING TOOLS • SPECIAL PRODUCTION TOOLS

Let our Engineering Department solve your Production Tool Problems.

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WALKER MAGNETIC CHUCKS are stubborn. The mule in this picture can hold his own for keeps, and the way the picure is drawn the man pulling the reins is anchored for keeps also. That's the way with WALKER CHUCKS, whatever gets on them stays there.

This new "All Purpose" Bar Pole Chuck is made to hold numerous small thin parts at one time as well as larger pieces. The total surface is magnetic, including both sides and top plates.

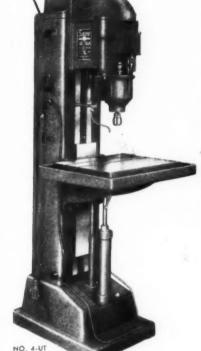
WALKER is the answer to your magnetic chuck problems.

O. S. WALKER CO.Inc.

WORCESTER 6, MASSACHUSETTS

Original Designers and Builders of Magnetic Chucks

COMPLETELY ACTION FIXTURES





TAPPER



IASTER DIAL FIXTURE





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Get fast, positive, instantaneous feed-get maximum production at low cost, by using a standard Snow automatic holding fixture essential complement to all three Snow Air Machine Tools.

Snow Tapping, Drilling and Threading machines are air-operated, electrically controlled -allow free interchange of any type of holding fixture. Split-second synchronization of a Snow fixture with a Snow machine is the perfect answer to all your tapping, drilling and threading problems.

Send prints or sample parts for production estimates and for quotations. Or write for catalog.





UNITED STATES ELECTRICAL TOOLS COMPETE IN PRICE and EXCEL IN PERFORMANCE

Whether you install just one US tool or set up a battery —as many industrial plants often do they fit into your production line just as perfectly as if designed by your

own layout engineers. UNITED STATES ELECTRICAL TOOLS are superb examples of the tool-makers' craft . . . still faithful to those old-fashioned ideals which started off this organization in 1897—fifty years ago. Design, engineering

and construction have been kept flexible to conform to present and advance requirements . . . but quality is undeviating.

VERTICAL SPIND GRINDERS

Angle plate mounting with screw feed, either vertical or horizontal. if desired

Also constructed for heavy thrust grinding with spindle in horizontal position. For use on boring mill, lathe, planer, milling machine, etc., they may be mounted at any angle. horizontal to vertical. Motors are 40-degree centigrade ratings, momentary overload capacity more than 100%. Heavy duty ball bearings support the chrome manganese spindle. Bronze bearings can be furnished for 5% additional charge.



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Drills, grinders, surfacers, polishers, sanders, tappers, saws, hole saws, valve seat grinders, valve refinishing shops, flexible shaft machines and other electrical tools.

The UNITED STATES ELECTRICAL TOOL Co.

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With the "Buffalo" Bending Roll and Leg-In Attachment, the once-difficult leg-in bending job becomes a simple, exact operation.

No more twisting of the material being bent, no more reducing the 90° angle between the two legs—for the rolls, with leg-in attachment, hold the arc or circle true. Too, fingers on the leg-in attachment show (without using template) when desired diameter is being bent. If you do leg-in bending, a "Buffalo" Bending Roll will quickly pay for itself in time savings, accurate results and elimination of waste.





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To suit your particular set-up, "Buffalo" offers both horizontal and vertical types in various capacities.

Bulletin 352-B, left, contains many practical suggestions on speeding up all kinds of bending operations—as well as complete engineering data. Write for it!

BUFFALO FORGE COMPANY

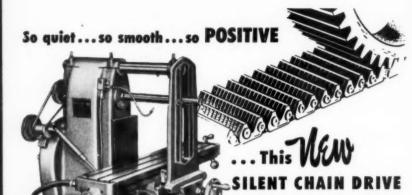
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Buffalo, N. Y.

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

"Buffalo

BENDING ROLLS



Here's perfect linkage between spindle and speed reducer in the new Diamond M-30. This silent chain drive transmits peak power without slippage . . . even down to 75 r.p.m.! Enables use of big cutters and heavier cuts than ever, yet is as smooth, quiet and vibration-free as ordinary vee belts over its full spindle speed range.

assures positive cutter rotation even at slowest spindle speeds!

The silent chain drive is just another of the many features that make the Model M-30 a favorite for both tool room and production milling operations.

For greatest economy in milling machines about both Diamond Models M-20 and M-30. Specifications of each are given below. Write for tree bulletins!

MODEL	TABLE	LONG.	TRANS- VERSE TRAVEL	VERTICAL TRAVEL	SPEEDS	TYPE OF	MOTOR	NET WEIGHT
M-30	7" x 30"	18"	6"	10"	Variable 75 to 1200 RPM	Silent Chain Variable Speed	1½ hp Fur- nished	1300 Lbs.
M-20	51/2" x 20"	12"	6"	9"	6 speeds 100-1400 RPM	Double Vee Belt	3/4 hp Recom- mended	750 Lbs.

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Manufacturers of the Diamond Line of Precision Machine Tools and Accessories





OUTPUT WAS 150... NOW 600

THIS manufacturer of bottle washing machines was using flexible shaft type grinders with 1¼" cones to clean flash off bottle grippers. Speed was 3600 R.P.M. Output per man per day was 150. The Rotor Application Engineer saw the job and recommended M-1086 Rotor Cone Wheel Grinders. Their speed is 17,000 R.P.M. They were installed with these results:

Labor cost cut 75%. Output was increased from

150 to 600 pieces per day. One man now does the work of four with slower speed grinders.

Wheel cost cut 80%. Cone wheels with old grinders were good for 30 pieces. With high speed Rotor tools, they're good for 150.

The Rotor Application Engineer may find similar savings in your production.

AIR O'TOOL

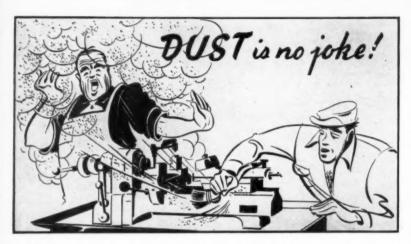
AIR

THE ROTOR TOOL CO

CLEVELAND, OHIO

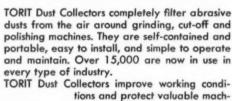
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UNBIASED ANALYSIS OF PORTABLE TOOL PROBLEMS



Why waste time dusting when you can eliminate abrasive dusts with

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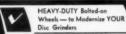
If your flat-surfacing costs are too high, or you are encountering checking, burning or distortion — let GARDNER specify abrasives that will solve your problems.

As the only American manufacturer who builds both DISC GRINDERS and ABRASIVES used upon them, our recommendations give you the benefit of undivided responsibility. No matter what sort of work you are handling on your Disc Grinders, GARDNER can supply the right abrasives for them. A few GARDNER features are listed here.

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Wheels in ALL SIZES — for all sizes and types of Disc Grinders

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Wheels in ALL GRADES — to suit YOUR material — YOUR areas — YOUR stock removal

Various BONDS — for wet or dry grinding — and for various speeds

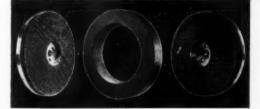
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Bore connecting rods quickly. Holes are round, straight, smooth, parallel. Require no hand fitting. Power drive is also available.



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Remove the ridge at head end of barrel on the same contour as cylinder, quickly and accurately.

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Lap rings into the barrel in a few strokes, assuring 100% contact. Take the guesswork out of fitting rings.

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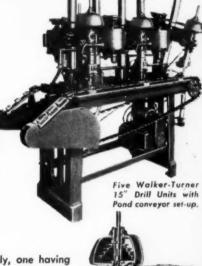
INCREASED 400% WITH STANDARD WALKER-TURNER

15" DRILL HEADS

This set-up for tapping, designed by Pond Engineering Co., Springfield, Mass., and using standard Walker-Turner 15" Drill Heads showed "better than a 400% increase in production over conventional methods."

Two pieces are handled simultaneously, one having three holes to be tapped, the other two. The operator places the pieces on the conveyer plates. The Pond Conveyer and the Walker-Turner Drill Presses do the rest automatically, and finished pieces drip into containers at the other end.

Walker-Turner Heads were chosen for this set-up because the Pond engineers wanted a light-weight, compact unit with extreme flexibility as to mounting, speeds and control. The unique design, rugged construction and low investment cost were other factors in the decision.



No. 9D13X, 15"

6 spline spindle, 4 bearing, $4^{1}/4^{"}$ spindle travel, speeds with 1740 r.p.m. motor 600 to 5000 r.p.m.

*Price less motor and column \$42.50

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benchmaster OFFERS A
LOW-PRICED BENCH MACHINE
FOR BOTH HORIZONTAL
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benchmaster mill with horizontal spindle overarm

SAVES VALUABLE SPACE-CUTS DOWN EQUIPMENT COSTS

Now you can obtain a precision perfect, high-speed benchmaster milling machine that's easily convertible from a horizontal to a vertical miller by simply interchanging spindle attachments. Its unusual versatility, plus the usual quality-plus benchmaster workmanship, make this double-duty milling machine an outstanding addition to your shop.

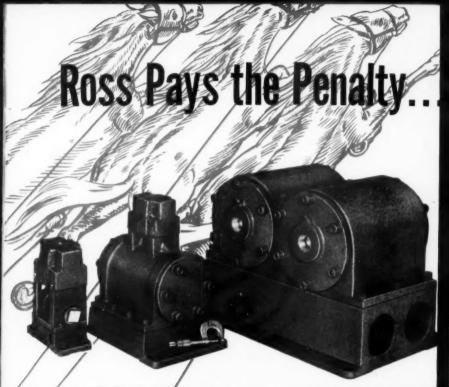
SPECIFICATIONS: Table size -6"x 14"—Three Tee Slots $\frac{3}{8}$ ", $\frac{2}{8}$ " center Longitudinal travel $8\frac{1}{2}$ "—Traverse travel $5\frac{1}{2}$ "—Vertical travel $8\frac{1}{2}$ " on vertical mill— $9\frac{1}{2}$ " horizontal mill—Height 28"—Weight (less motor) 215 lbs.—Requires $\frac{1}{3}$ h.p. motor—Spindle speeds (standard 1725 rpm motor) $450-850\cdot1400\cdot2100$ rpm.

For complete information write to Dept. MT-7



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Years of leadership in air power control has piled a burden of responsibility on Ross engineering and production genius. But you'll see no shirking here, for Ross seeks new problems . . . new challenges . . . in order to provide new solutions to the complexities of air-controlled operations in industry.

As the power of modern machinery grows, Ross is obligated to develop fast, safe, sure controls to bridle these servants of industry. Each problem results in a further expansion of the Ross line. Thus Ross wins and holds the confidence of designers and engineers in the field of machine control, for they have learned to rely on Ross.

The scope of the Ross line is symbolized the valves shown . . .

#700—¼ "10 ¾ "pipe size, available as 3-w 4-way, or 4-way, 5-port. Solenoid operat general purpose.

#707—2" capacity, 3-way, solenoid operal Introduced recently—wills were incorpora in design of continuous steel tube piercing i unique in its field. All operations automatic.

#664—3" pipe size, 4-way, 4-port hydra cally operated air valve. Designed for series giant die-casting presses. This installation hydraulic but valve may be solenoid opera on either air or hydraulic press application. There are more them 500 valves in the Ross I working for the benefit of all industries.

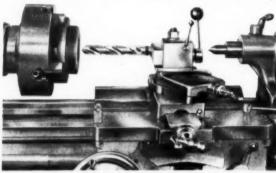
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ADAPTABILITY—Doubles engine lathe usefulness.
Unlimited number of operations in one chucking.
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Operates at higher speed—4,400 blade feet per minute. Smoother and faster cutting. Sturdy enough for foundries and production. Accuracy to spare for tool and die work, like contour sawed cams, dies, and punches; ideal for experimental laboratories and pattern shops.

Single and 8-speed back-geared models for cutting practically any material. Clears 8%" under the guide.

One-piece welded steel frame has tremendous strength. Wheels and blade, except at cutting point.

are entirely enclosed. Cabinet type base has sealedoff motor compartment. High safety rating.

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SPECIFICATIONS:

Sawing Capacity: Blade to guard—131/4". 27" dia. work. Guide to work table—8%". Table: Tilts on Double Trunnions. Size 15"x15½". Height Overall of Floor Model: 67". Blade Widths: 3/16", ½4", ½6", ½5" and ¾4". Length of Blade: 98". Wheels: Disc. Moulded Textolite, 14" dia. 1" face.

Bearings: Grease-sealed Ball Bearings.

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specify only the products of manufacturers who SPECIALIZE in producing power tools, rather than making them a sideline.

OICE-CRANE COMPANY

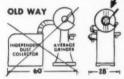
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- Protects nearby machine tools against excessive wear from dust and grit.

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INTERCHANGEABLE STANDARDIZED PARTS

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THE CONWAY CLUTCH CO.

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Metal Cutting Band Saw with controlled. automatic cutting that reduces operator fatigue. makes better cuts and lengthens blade life. With the new Wells No. 12, just place the stock -bars, rounds, sections or pipe - in the quickacting vise and push the starting buttons-the machine does the rest. The head comes down automatically, feeding the blade into the stock at a controlled pressure. At the completion of the cut, the head is raised hydraulically to a predetermined position and the motors shut off. Write for complete details and literature.

DESIGN DETAILS

- · Heavy duty suitable for production or general utility.
- · Blade is in horizontal position at all times.
- · Hydraulic controls for head motion.
- · Blade pressure controlled by sensitive micro-switch and solenoid.
- · Capacity: rectangular 12" x 16"; rounds, 12" Dia.
- · Blade: 1" x .035" x 13' 7"
- . Speeds: selective, 50, 90 or 150 ft. per min.
- · Motors: 3/4 H.P. blade meter, 1/3 H.P. hydraulic system motor.
- e. Weight: approximately 1750 lbs

WELLS MANUFACTURING CORPORATION

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Products by Wells are Practical





SINGLE PHASE
½ hp and ¾ hp
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250 FINDLAY ROAD

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LIMA GEARSHIFT DRIVES





CLEARANCE -

TIP

This photo is 3 times actual size of a patented HY-CO J2 center drill.

TIP CLEARANCE PROLONGS LIFE

Center drill breakage can be reduced only when drills have "Tip Clearance", and only HY-CO Drills have this patented feature. Savings due to tip clearance are phenomenal. HY-CO Drill users (names on request) are reporting two to four times increased tool life, and some records (available) show savings up to ten times greater than with conventional center drills.

How Tip Clearance Prevents Breakage

Note from enlarged photo above and the side sketches, that there is a decreased load on the cutting edge. Due to tip clearance there is freedom from binding in the pilot hole, which combined with the greater spiral relief made possible by the drill contour, permits easier flow of chips and less danger of chip jamming. But longer drill life is not the only advantage of HY-CO Center Drills.

Band Contact abolishes out-of-round work

The Sphere-O-Form contour leaves a hole with convex sides. When the 60° machine center enters the curve it automatically establishes a true, never changing center of rotation. This BAND CONTACT ABOLISHES OUT-OF-ROUND WORK and provides increased lubrication for a cooler bearing between work and machine center.

HY-CO Center Drills not only outlast old style center drills, abolish out-of-round work, and increase machine center life, but they eliminate the need for type "B" drills by automatically providing the sofety feature of bell-type drills. Write today for complete information, prices and nearest distributor—HOWARD H. HEINZ, INC., DEPT. BB, 2525 HILTON ROAD, DETROIT 20. MICHIGAN.

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Center Reamers



Due to tip clearance only the very tip of a HY-CO drill does the drilling. Normal frictional heat is less; it is created only at tip—is dissipated over radial surface.



A finished center hole. The Sphere - O - Form contous abolishes FATIGUE POINT — the convex center hole enables the machine contet to form a BAND CONTACT which eliminates galled machine centers.



Countersinks

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Brightboy also provides wide opportunities for

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because of the innumerable techniques made possible by Brightboy's resilient rubber and abrasive combination.

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Investigate the extensive savings and finishing scope of Brightboy. Ask your dealer for the Brightboy manual and prices. Write for a Brightboy service engineer to call regarding specific finishing objectives.



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Weldon Roberts Rubber Co.

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Steel forks bearing on a bronze ball, with heat-treated centerless ground pivot bearing pins. Large pin provided with oiler to enable proper lubrication of all bearing points. Ball surface offers minimum of friction loss, insuring long life for light load transmission or for hand operated controls.

Available now in $\frac{1}{2}$ and $\frac{3}{4}$ sizes — other sizes in production.

DEPT. B-1

CURTIS UNIVERSAL JOINT CO. INC.



No. 58—Adjustable Type Machinist Level with internally ground and graduated vial, sensitive in the range of 2-4 minutes of arc.

No. 24A—24" Forged Aluminum Level with 6 adjustable vials—Double Plumb—Double Mitre—Double Level—Guaranteed accurate to ½ degree.

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The gradual, orderly expansion of the Reltool line has resulted in constantly increasing recognition and demand for these reliable metal cut-

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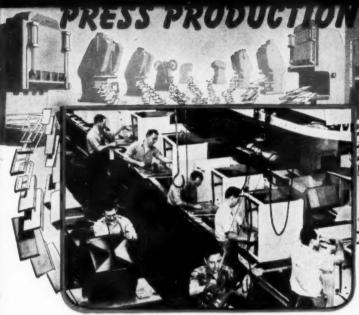
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The Reltool Franchise is still available in A Few Choice Territories to those who can provide Adequate Sales Repre-sentation for the expanding Reltool Line.

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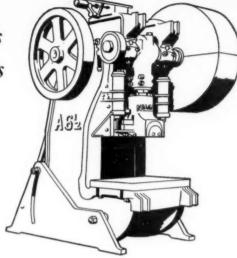
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CONCAVE SIDES HIGH SPEED STEEL

Well-designed teeth. Concave sides ground accurately for proper clearance. A Lenox Quality Tool in all respects.

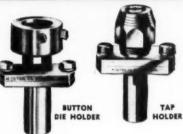
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Time-Tested Gervice-Troved 30 YEARS ENGINEERING "KNOW HOW" GUARANTEE THE PERFORMANCE OF multi-Purpose **SHAPERS**

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All three models of GEMCO Multi-Purpose Shapers...Plain, Production, and Universal types...incorporate important features in design that have been proved by 30 years of research, proved by actual tests in countless machine shops or suggested by operators from all parts of the country. These superiorities, resulting from the composite thinking of men who know, make GEMCO Shapers first for high performance, wide adaptability, maximum economy and lower production costs...and increased profits. Featuring in addition, GEMCO'S own exclusive LUBRIGARD, the safety device that prevents damage to the machine through any failure in the lubricating system, GEMCO Shapers give longer, trouble-free service. Complete and detailed description of the features found only in GEMCO Shapers are set forth in the Bulletins that are free to you for the asking.

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FOR MASS PRODUCTION DRILLING

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A TYPICAL CASE



16 holes are drilled, some counterbored, all in 30 seconds, on the multiple head and fixture unit below. Set up of the unit on any drill press is a matter of a few bolts.



The main reason is that the Ettco-Emrick Multiple Head System gives any required drilling or tapping production at lowest tool and labor costs.

The System is based on the principle that the **method of handling** any given small part for drilling or tapping is as important as the use of multiple spindles in determining production rate and costs.

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GET FULL DETAILS IN THE NEW BULLETIN 31

It includes many examples of actual Ettco-Emrick Multiple Head jobs. Write for a copy today.

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stay put regardless of the most chattering vibration . . .

Knurling of Socket Screws originated with "Unbrako" in 1934.

"Unbrako" and "Hallowell" Products are sold entirely through industrial Distributors.



Kits: Pats. Pending

The "Unbrako" Socket Set Screw (A) with Knurled Cup Point is a Self-Locker whose point digs-in and stays dug—regardless of the most chattering vibration. Yet, it can be backed-out with a wrench and used over and over again. The "Unbrako" Socket Set Screw with Knurled Threads (B) is a most excellent Self-Locker, too, because the knurling, as shown, swages the threads when locking results. To be used with points such as; flat, dog, cone and oval which do not lend themselves to knurling. In sizes from No. 4 to 1½" in diameter . . millions in use. Write for the "Unbrako" Catalog of Socket Screw Products.

You can't tighten (or loosen) socket screws without a hex socket wrench, so why not get our No. 25 or No. 50 "Hallowell" Hollow Handle Key Kit which contains most all hex bits.

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Speeds Output... ELIMINATES BURNING OF CENTER
OR GOUGING OF WORK

You can do a mass production job... with improved quality and better results per man-hour...
 when you use Ideal Live Centers on your lathes.
 No friction between the Live Center and the work—permits deeper cuts and faster turning speeds.

Check the advantages of the Ideal Live Center—unique bearing arrangement—specially selected bearings—short overhang—all parts hardened and ground—thoroughly tested and proved. Highest quality at no extra cost.

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Also Heavy Duty Live Center

—built to carry heavy loads.

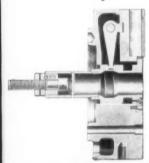
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... developed to aid the Metal Working industries in increasing production and reducing Production Costs







WITH THESE TIMELY FEATURES

New "Accrelock" precision jaw edjustment feature on adjustable serrated jaw chucks provides most precise and positive method yet devised for this important adjustment.

New one-piece, light weight steel chuck bodies, with weight correctly distributed to assure rigidity and maintained accuracy while reducing flywheel effect in high speed operation.

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New PRECISION in construction and close tolerance fit of all parts. Chuck bodies accurately balanced.

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A comprehensive series of chucks in adjustable serrated jaw . . . manufacturing ... screw adjustable ... and compensating jaw styles. Also 2-jaw round body and gib type chucks and collet chucks. Furnished with both straight recess and American Standard tapered recess mountings. American Standard jaws and top jaws. Newly designed rotating air cylinders and air control equipment developed to assure a "balanced" power system. Easily installed, compact and efficient, greatly reduced maintenance.

A comprehensive series of stationary air cylinders widely adaptable to shop and machine tool applications calling for powerful, dependable units with precision control.

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Series 5230A-1 "Accraleck" Chuck



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Weigh 700 pounds with floor stand.

in use 1 h.p. motor.

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*One of Hollywood's foremost camera craftsmen. Armor Mill purchased through: Production Machinery Sales of Los Angeles.

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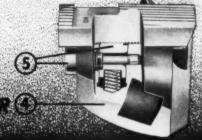
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Ground Thread



PRODUCE BETTER THREADS at LOWER COST!

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- They are hardened and ground throughout. The body is lapped on the face and in the dovetail slots. Chaser holder bearing surfaces are lapped into the body.
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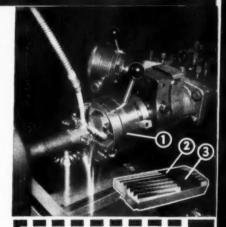
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3/4 x 3/4 C.R.S.

BARS HORIZONTAL ONE

VERTICAL . . with 1/4" holesmachined at the desired spacing.

HARDENED PINS

... used to select locations according to the desired pattern of holes.

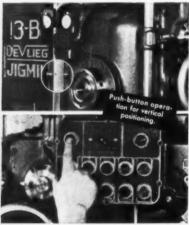
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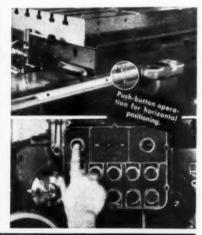
... accurately and dependably provides foolproof spacing for machining repetitive parts without jigs.

The finest known process for occurately spacing and machining hales.

Illustrated at right is one vertical bar and one horizontal bar with pins used as masters on the 38 DeVlieg Duplitrol Equipped Jigmil. Below are illustrations showing how all spacing is done in response to push-button operation.







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1 Drill and ream the hole in the part to size. Sturdy Square Holed Sleeves are furnished to the size shown in the specification table or they may be ordered with .015" grinding stock so that you can grind your Sleeve to fit.



2 Sweat or press Sleeve into place. It is longer than the diameter of the Sleeve should be set flush with the OD at the threaded end and the excess all If the Sleeve ter of the bar, h the OD of the excess at other bar, the



3 Drill and tap for set-serew. This set-screw not furnished with the Sturdy Square H Sleeve although the back-up serew is furnished. This set-screw is

OVER 30,000 IN USE



One of the most difficult problems in tool making can be solved easily and quickly with Sturdy Square Holed Sleeves. The perfection of broached square holes can be had in boring bars, milling cutters and many other applications at a small fraction of the cost of imperfect hand-made square holes. The Sturdy Square Holed Sleeve consists of a round sleeve with a perfectly square hole broached through the center. This hole is tapped at one end to receive back-up screw which is furnished with the Sleeve. The Sleeve can be sweated or pressed into a drilled and reamed hole to make a perfectly square accurate hole in a very few minutes.

The Sturdy Square Holed Sleeve will save you many hours and

many dollars in the making of boring bars. milling entand ters other tools r equiring square holes.







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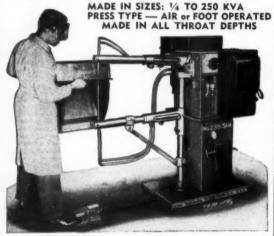


milling cutter made from a simple blank turned to size on a lathe with Sturdy Square Holes Sleeves sweated in to hold standard tool bits.

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VERS-0-TOOL'S

CAPACITY	CAPACITY	MAX. PITCH	MAX. LENGTH	
3/6"	3/4"	0	196"	2
364	1 "	16	%°	media.
13/6"	136"	16	3/4"	BASSES BASSES
1 "	13%"	16	3/4"	\$2000 BOX 1000 BOX 10
13/4"	11/2"	16	3/4"	
1 "	236"	16	3/6"	STATE OF THE PARTY
23/6"	3 5	10	11/4"	
33%"	41/4"	12	11/4"	
41/6"	51/2"	10	13/1"	

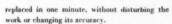
(Ask for complete oversize table)

> The oversize capacities, indicated in the above table, cannot be built into other types of threading heads.

> Only the Circular Chaser design permits you to handle larger diameter work on the same head by merely changing the cutters and blocks—for either threading or hollow milling.

Here is a Vers-O-Tool plus value—an important saving in tool costs,

Ground Thread Circular Chasers provide 4 to 10 times more cutting life than any other type of chaser. They may be reground through 270° circumference. Chasers, mounted on blocks, are



Vers-O-Tools are hardened and ground throughout—fast, high-precision, long-lived, profit-making tools.

Catalog D-42-C gives complete details,

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DEMONSTRATED
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Machine Tool Show CHICAGO—SEPT. 17-26

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Save time on pressing, bending, straightening with a KRW HYDRAULIC ARBOR PRESS

INDISPENSABLE IN ANY SHOP
...HANDLES SHORT-BUN PRODUCTION WITH LOW-COST DIES
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CAPACITIES, EITHER HANDOPERATED OR MOTOR-BRIVEN,
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now they are built in innumerable shapes, sizes and adaptations to work on hundreds of production jobs other than common straightening, bending and pressing work.

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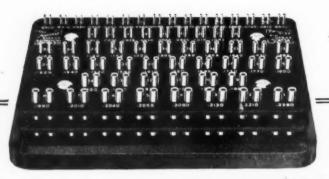
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DRILL SIZE PIN GAGES

Class Z Accuracy

LETTER SET—52 gages in 26 pairs from A to Z. \$45 set.

FRACTION SET—60 gages in 30 pairs in steps of 1/64" from 3/64" to 1/2", \$50 set.

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All sets include stands ... Prices F.O.B. Bridgeport, Conn.



Sets in pairs of gages for checking any number of similar holes. Stands have 3 plates and cover so that gages stand upright. Drill size is plainly stamped in front of each gage hole, together with decimal equivalent to the ten thousandth of an inch.

IMMEDIATE DELIVERY - 116 SIZES

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THE Horbery GAGE COMPANY

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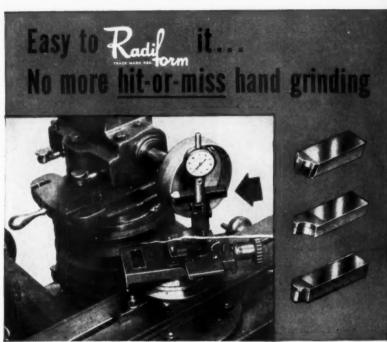
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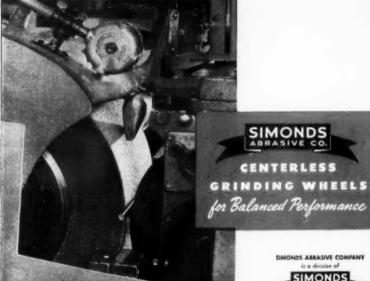
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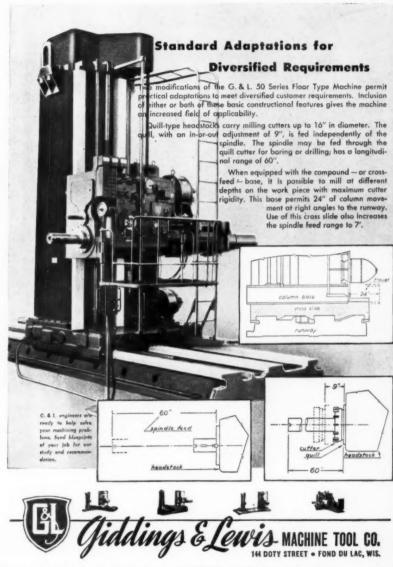
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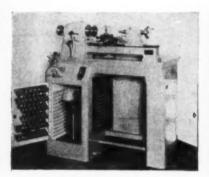


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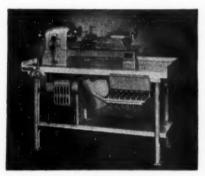
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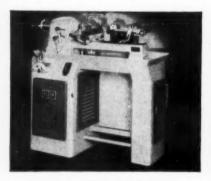
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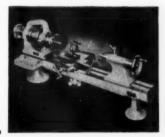


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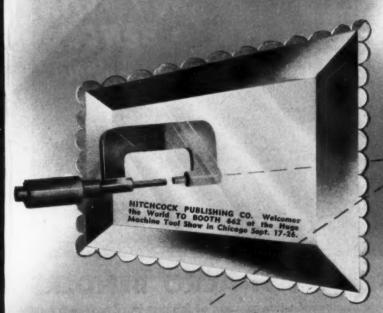


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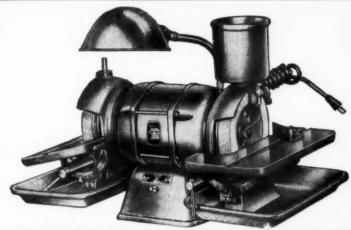
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Teatured in this issue.

HOLE LOCATION METHODS—FROM MAKESHIFT TO PRECISION, by Frederick C. Victory. Present methods of hole location leaves much to be desired from the standpoint of accuracy. The author analyzes present methods and suggests an improved procedure. Page137	NATIONAL MACHINE TOOL BUILDER'S ASSOCIATION ENJOYS COLORFUL BACK-GROUND. The sponsors of the show and spokesman for the machine tool industry has been in existence for approximately 45 years. Page
OPERATION OF ENGINE LATHES. This concludes the series of engine lathe operation reprinted from the Shell Oil Company's book, "Changing the Shape of Metals with an Engine Lathe." This installment continues last	by H. L. Purdy, presents a short history of the host to the Machine Tool Show for the benefit of the many overseas visitors who will attend the show. Page
month's discussion. Page151	A SHORT HISTORY OF THE MACHINE TOOL INDUSTRY, By William F. Schleicher,
NEW PLUG GAGE SIMPLIFIES GAGING OPERATION. These gages follow the principle of using spherically shaped gaging surfaces which are brought into contact with the bore walls after the gaging member has been inserted into the bore. Page174	traces the development of the machine tool industry from Maudslay's earliest lathe to the latest behemoths of the production line. Lack of space permits only a general discussion of the subject. Page
LIQUID POWER. The procedure for emboss-	WHAT'S NEW IN METALWORKIING. Page
ing and drawing sheet metal in one operation with the use of water under high pressure and only one die section is here outlined.	SHOP HINTS. Page
Page	FIGURING OPTIMUM STRESS FOR TOR- SION SPRINGS, by Edward J. Rantsch.
LETTER FROM ENGLAND, by Robert Hutcheson, Page	Page326
PRECISION MEASUREMENT, by Warren	NEWS OF THE INDUSTRY. Page331
Baker. This is part 12 of Mr. Baker's series. In this installment he discusses the general	AVAILABLE LITERATURE. Page337
methods for inspection and measuring plug and ring gages, taper plugs and plug and ring	NEW TECHNICAL BOOKS. Page342
thread gages. Page212	INDUSTRIAL FILMS. Page346
NATIONAL MACHINE TOOL SHOW. This issue of the MACHINE and TOOL BLUE BOOK will be sent to many overseas engi-	Page
neers, buyers and industrialists. Information of the coming Machine Tool Show which will	PRODUCTS INDEX, Page376
interest them are stressed. Page227	INDEX TO ADVERTISERS, Page382
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As the MITOP SEES IT.

THE HIGH COST OF IMMUNITY TO MECHANIZED EQUIPMENT

The amazing improvements made in metalworking equipment in the last two decades is equalled only by the phenomenal production increases and lowered costs reaped by the progressive manufacturers who installed mechanical genii on the production line. Some of our more respected shops would not merit anybody's applause for high caliber work had they not engaged the help of new methods, speedier techniques and better machines. Yet, when confronted with the visible result of cost dollars saved and production hours gained, to say naught of manpower conserved, it is wondrous to note, on the other hand, the dexterity with which some shops sidestep modern machines and techniques. Such agility in dodging the benefits of new ideas and time saving production equipment belongs on the dodgeball field and not in a 1947 manufacturing plant.

The writer recently concluded several sorties into eastern, southern and middle western shops where he witnessed the intelligent use of streamlined mechanized equipment as well as stumbled over and gazed spellbound at ancient American museum pieces. One shop harnassed the expensive manpower of fourteen girls to perform deburring operations, using elbow grease and files. . . a small speed lathe with one operator would have been the answer. A manufacturing executive cried over the high cost of doing business; yet all his equipmen was powered by overhead drives which wrestled with slow and bearded

grandads of the good old days. In another shop, four men, arranged in a row like toy soldiers performed a drilling operation on a casting. The first operator drilled one hole, passed the casting to the next who drilled the second hole, then passed the casting to the third and fourth for two more drilling operations. When asked about the advisability of installing a multiple drill press, which would drill all four holes simultaneously, the works manager shrugged his shoulders... "these things cost money."

With the whirlwind advances made in carbides, moss-backed conceptions of speeds, feeds and work-holding devices have been carefully labeled and tucked away by modern shops as the relics of a dead era. Yet in shop after shop carbides were shunned like rare 5-legged zoological specimens having no business in a machine shop. Another plant surfaced small aluminum gear housings in a milling machine when a wet belt surfacer could have upped their production tremendously.

If the coming Machine Tool Show accomplishes little else but jar some metalworking executives into cognizance of the necessity of installing modern production machinery, the show will be a success. It is difficult to believe that shops now tussling with museum machines will be unaffected by demonstrations of latest equipment and will remain immune to the advantages to be derived from the purchase of latest machine tools.

William 7 Schleicher

A BUYING GUIDE FOR ABRASIVES

Point No. 6

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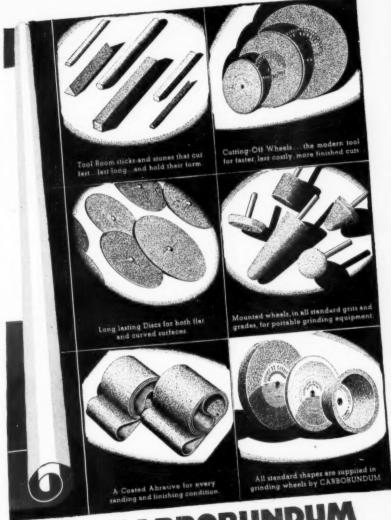
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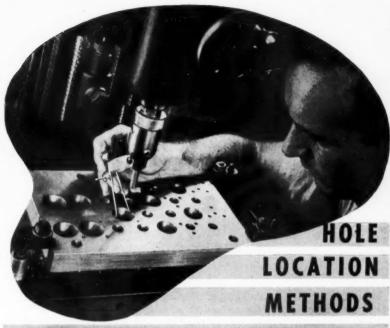
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Frederick C. Victory

Chief Engineer, Moore Special Tool Company

Jig Borer and Jig Grinder provides an efficient locating method, coordinates, eliminates the translation step, and provides ideal machining conditions. A comparison between the new hole-locating machine and old methods is undertaken by the author.

Accurate location of holes has always been a serious problem both in tool-making and in production work. Results obtained by makeshift methods are usually far from satisfactory, from the standpoint of accuracy and economy—the only true index by which the job may be evaluated. The solution to this problem lies in specialized hole locating machines such as the Jig Borer and Jig Grinder.

Perhaps the best approach to any dis-

cussion of hole location problems would be an analysis of the three phases of the problem.

I.—LOCATING—FIRST STEP

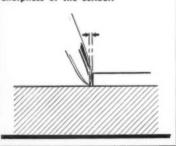
A. Layout of lines and prick-punch marks directly on the surface of the part to be drilled.

Several variations of this method produce results within widely differing accuracy ranges.

1. The use of a combination square and a scriber produces results within about .005". Factors contributing to this inaccuracy are readily understandable. Graduations on the scale are too coarse to permit accurate settings and further it is necessary to sight the graduation along the body of the square. Another variable is introduced by the angle of the scriber to the edge of the square and the work.

2. A surface gage permits a somewhat higher degree of accuracy since it can be set in reference to a scale without the necessity of sighting along an obscuring edge, as is the case with a combination square. The use of a surface gage also eliminates the error resulting from the angle of scriber to scale. Accuracy of surface gage line is seldom

Fig. 1. The "furrow", or line, scribed by a scriber at the end of a scale, is not flush with the scale, but some distance away, depending upon the sharpness of the scriber.



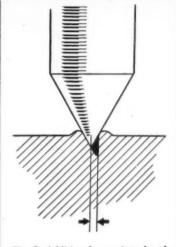


Fig. 2. Additional error introduced by prick-punching. The most accurate layout method, employing wedge-shaped scriber, unfortunately introduces largest error in prickpunching; two sides of scribed line are of unequal steepness. Error is minimized by scribing fine lines.

better than ±.002".

3. The height gage is the most convenient and reasonably accurate layout tool. By virtue of its vernier it may be fairly easily set within ±.0003".

A planer gage, used as a layout tool, may be set with a micrometer caliper to somewhat closer limits than a height gage.

Direct use of gage blocks permit the highest degree of accuracy obtainable by the layout method.

Unfortunately, a considerable part of the accuracy otherwise obtainable with the height gage, planer gage and gage block layout is lost because of the inherent shape of the necessary scriber. One face of the scriber is lapped flat and the other face is lapped to a sharp wedge. The center of the line produced by this shape is not central with the bottom or registering face of the scriber; instead the bottom face of the scriber determines the bottom edge of the line. Wear introduces considerable error, varying with the condition of the scriber and the depth of the line, Fig. 1.

4. Prick-punching of the intersection of the scribed lines is a step common to all layout methods of hole location and is a further source of inaccuracy, detracting by some amount from whatever accuracy is obtained by scribing. The punch will not accurately center itself in the line because both sides of the line do not make an equal angle to the vertical, the shallower the line the less the error, Fig. 2. A very light tap with a hammer is the best technique, making a mark 1/64" in diameter; this may then be carefully enlarged to size, making sure that the original location is not disturbed

Instead of the conventional type, a rotating prick-punch is sometimes used to avoid the necessity of too coarse a line. This slender piece with its acute angle point materially reduces the error resulting from pricking. Made from a twisted piece of square stock, downward pressure of the fingers causes it to rotate, wearing a slight indentation in the piece. While this mark is not large enough to center a wiggler or start a drill, it may be enlarged by a standard prick - punch and hammer, working carefully and examining the result of each step with a glass to make certain that no further error has been introduced.

B. Buttoning—a method employing the toolmakers "button"; a hardened steel cylinder, is particularly adapted to boring or grinding operations where higher accuracy is required than that expected by wiggling. In the case of a soft workpiece, the button is attached to the face of the workpiece by means of a screw in a small tapped hole roughly located in the position of the desired finished hole. Where a hole is to be relocated in a hardened piece the button is fastened through the existing hole.

In either case the screw is loose enough in the button to permit it to

Fig. 3. Single-point boring . . . the most accurate finishing method. Surface is generated by rotation about axis. Either workpiece or tool may rotate. Final accuracy and finish depend upon rigidity and accuracy of spindle and cutting tool.



be tapped with a brass hammer until its center coincides with the center of the desired finished hole. Measurements are made with a height gage or by comparison with gage blocks. This is a painstaking operation because the button must be aligned in two directions. A tap in one direction frequently displaces in the other direction also. Sometimes final tightening shifts the button, making it necessary to re-check and relocate.

Under ideal conditions, and with an excellent machine spindle, this method may produce results within ±.0005".

C. Transfer— a means of relating the relative positions of corresponding holes in two pieces which must match each other, most frequently used where the exact desired location is not known. Special prick-punches may be used to establish pick-up points on the work-piece, or holes may be drilled through the workpiece using the original as a guide or jig. For higher accuracy the hole in the master from which the transferring is done is first trued up before boring the workpiece.

Before discussing the fourth or coordinate location system of hole location, a few generalizations applicable to the previously enumerated methods should be in order.

While accuracy of location is, in itself, vitally important, it cannot be disassociated from contributory errors resulting from additional operations. Each of these method requires the translation of location attained to the machining setup. This step, even when carefully done, can easily add errors at least equal to those inherent in the locating method.

For example, in drilling and counterboring directly from a layout, a practice frequently employed as a shortcut, errors of considerable magnitude may be introduced, particularly if the very best technique and highest skill are not employed. These errors may arise from the initial pickup of the prick-punch mark, or from any of the steps involved in opening the hole to size.

In the case of wiggling, or picking up the location in a lathe, the result is likely to be more satisfactory, largely because the hole location after drilling, is corrected by single-point boring, the greatest translating error being in the pick-up.

The more accurate method of accomp-

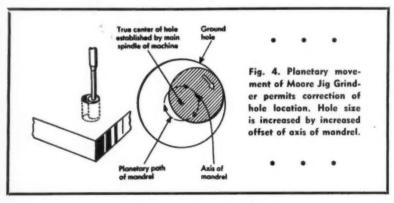






Fig. 5. Jig Boring and Jig Grinding quadruple die. Manufacture of tools on interchangeable parts-and-assembly basis promotes phenomenal delivery of dies to pressroom.

lishing the translation step results from the use of toolmaker's buttons in the original determination of the location of the desired hole. Having the location established by the button, the workpiece is shifted around until the button indicates true with the lathe or machine spindle.

Because of the variety of transfer methods, it is difficult to evaluate the translation error. Where special prick punches are used, or where the master is used as a jig, considerable error may be introduced in this step. Picking up the master hole and finishing the workpiece hole by boring gives best result with this method.

D. Coordinates. Recognizing the shortcomings of all of the previously described, and admittedly makeshift methods, industry has long searched for a more efficient means of achieving the desired result. Location is achieved by movement of either the workpiece or machine spindle to definite measurements by devices extraneous to the

workpiece; usually a part of the machine.

II—CUTTING—SECOND STEP

The removal of stock, or machining method is tremendously important in its relationship to the final location of the hole.

The least accurate methods are drilaing, counterboring and finally reaming from a prick-punch mark; the tool being guided or located by the material being machined.

Slightly more accurate is the use of some extraneous guide for the drill such as a bushing or, in transferring, the master hole.

The highest degree of machining accuracy in unhardened steel is achieved by single point boring, Fig. 3. The principle of this operation is geometrically correct since the point of the cutting tool generates a true circle or cylinder, the axis of which is the axis of rotation of the machine spindle. Although spring

in the tool may affect accuracy during roughing, this condition can be eliminated by taking light finishing cuts. In boring cylindrical holes either the workpiece or the tool may revolve.

The mere fact that a hole is bored with a single point tool is, in itself, no guarantee of accuracy. Several conditions of machining may produce errors in location even though the original location and translation were accurately accomplished.

At least in toolmaking, most boring is done on a lathe and seldom is the spindle good enough to assure accuracy down to the last few "tenths." Looseness in the spindle causes inconsistent indicator readings in picking up location and it will bore out of location. Then too, the clamping of the workpiece must be very carefully done in order to be sufficiently rigid to resist tool thrust and centrifugal displacement and yet not spring or cramp the piece. If the piece is unsymmetrical, as is usually the case, it is necessary to carefully counterbalance in order not to introduce another error.

The equivalent of boring, for hardened steel, is grinding, Fig. 4. By use of an abrasive wheel or diamond-charged mandrel the same high degree of locational accuracy may be obtained as in the case of single point boring, but subject to the same errors due to shortcomings of equipment and technique.

Terms Are Misleading

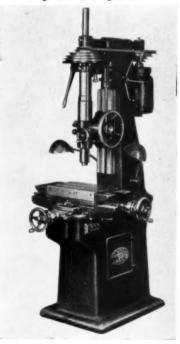
From the foregoing discussion it may readily be seen that the term "Hole Location" is actually a somewhat misleading term for what proves to be, due to makeshift methods and equipment, a complex and costly series of operations.

Each step of the outlined methodsestablishment of location, picking up or translation of location to machining setup, and machining-introduces unpredictable errors. Further, each step is time-consuming in direct proportion to the degree of accuracy required.

Obviously the logical and direct approach to the problem lies in a specialized machine which takes advantage of the most efficient locating method. coordinates, eliminates the translation step, and provides ideal machining conditions.

Basically the concept of a machine specifically designed for precision hole location should provide a rapid and accurate method for moving the workpiece to desired locations, and a rigid,

Fig. 6. Moore Jig Borer



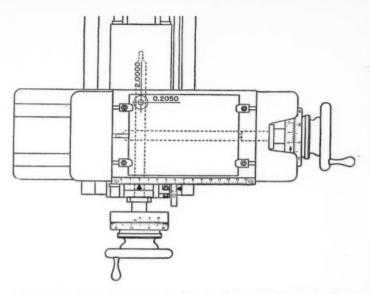
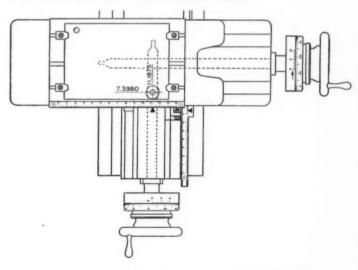


Fig. 7. Top: sketch showing relationship of scales and dials with coordinate dimensions. Bottom: same moved to different location.



accurate spindle. The answer is found in the Jig Borer, on the one hand, for soft material, and the Jig Grinder, on the other, for hardened material, Fig. 5.

It was but a logical step for such a machine to be built around the coordinate system, the ultimate location system. In order to derive the greatest benefit, the measuring system should be so designed as to promote its fullest use.

Of the three conventional measuring methods, graduated scale, size blocks, and lead screws or micrometer screws, the latter offers the best conditions.*

Since the Moore Jig Borer, Fig. 6, incorporates screws in its design it will be used in describing the modern method of precision hole location.

In the Coordinate Location System as applied to the Moore Jig Borer, the workpiece is related to a pair of imaginary crossed zero lines, horizontal and vertical, intersecting at the rear left hand corner of the table, Fig. 7, and in the upper left hand corner of the drawing. Coordinates are dimensioned from these zero lines. They are not customarily written on dimension lines terminating in arrows, but on or above the lines whose distance from zero they are intended to designate. The following

comparison, Fig. 8, will illustrate this principle:

Fig. 8 (left) shows a conventionally dimensioned drawing of a job to be jig bored. Dimensions are shown referring to the edge of the piece and from one hole to another.

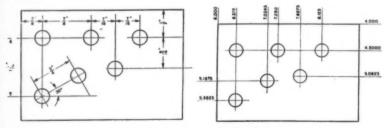
In order to re-dimension the drawing according to the best Jig Borer practice, it is only necessary to calculate coordinate positions for the hole centers and assign some nominal, unit value to the upper and left hand edges of the piece.

For example, 4.000" and 6.000" were chosen, and the coordinates figured from these values as shown in Fig. 8 (right). This type of dimensioning is the most direct and least confusing to the operator.

In the Moore Jig Borer it would be only necessary to locate the corresponding reference edges of the piece approximately, since the scales can be set to the nearest full inch and the dials set to zero.

*For a full discussion of this subject see "Precision Hole Location for Interchangeability in Toolmaking and Production," by J. Robert Moore, published by Moore Special Tool Company, Bridgeport, Conn., 448 pp, \$3.00—Editor.

Fig. 8. Left: conventionally dimensioned drawing. Right: same, with rectangular coordinates.





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Should it be advisable to set up the piece in a different table location the new reference figures can be added to the drawing and by simple addition or subtraction, the coordinates corrected.

The best Jig Boring practice is to spot, drill and rough bore all holes in the workpiece consecutively, before finish boring any of them to minimize operator error, and errors caused by stresses or temperature changes.

The Moore Jig Grinder, Fig. 9, based on the same location and measuring system, performs the same function in hardened steel as the Jig Borer does in soft material.

Since the positioning of the work by the lead screws is inherently correct, there can be no cumulative error from the first operation to the final machining cut, as would be the case with any other less direct and geometrically correct method.

With the firm establishment of the



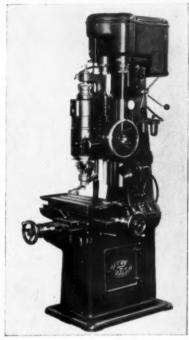


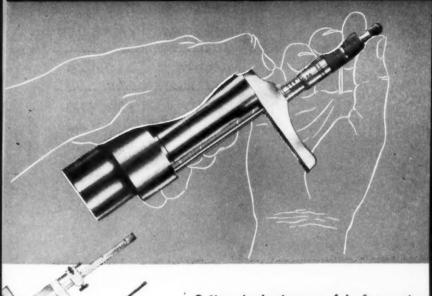
Fig. 9. Moore Jig Grinder.

Jig Borer and the Jig Grinder in the field of hole location and machining, the transition is being made from inefficient, makeshift methods giving results of questionable accuracy to working to known dimensions assuring interchangeability of location. THE END.

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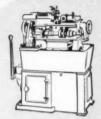
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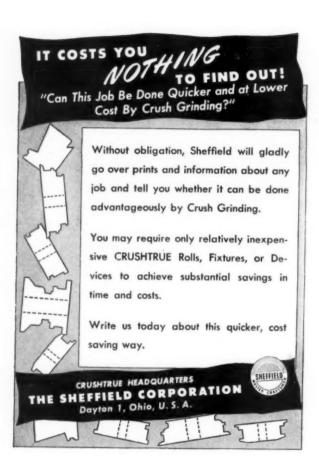
(8) Stopics Carboloy-tipped Solid Stab Scree Machine Recents.

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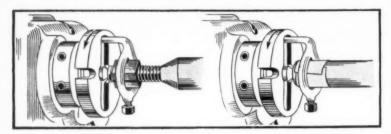
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A dog, especially its set screw, may mar the surface of a workpiece on which a finish cut has been taken, and, it will certainly damage a thread. These things can easily be prevented by the proper precautions.

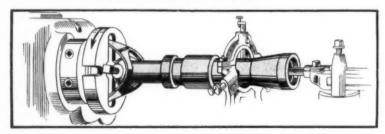
Let us first deal with different ways of protecting a thread. One method is to wrap a relatively heavy piece of soft metal, preferably copper around the threaded area. The most satisfactory method, however, is to use a nut that has been either split on one side or cut in two. In either case, the saw cut will have removed enough metal to permit the pressure of the dog set screw to re-



duce the diameter of the nut, and thus seat the thread of the nut securely on the thread of the workpiece so it will not slip. As a rule, the nut is turned to a cylindrical form.

The illustration shows how a square nut, split on one side, should be placed in a dog with a heart-shaped opening. In this case, the dog opening must be only slightly larger than the nut, so that when one corner is in the V, the pressure of the set screw will be exerted on the side of the nut adjacent to the split, as shown. This will permit the set screw to close the nut and grip the threads. However, a cylindrical nut that is cut in two is the most satisfactory, because it does not have to be screwed into place, and it can be released by a slight tap with a hammer. A finished surface may be protected from damage by the set screw, by a piece of soft brass or copper wrapped around the workpiece as illustrated, or by the use of a split collar.

Sometimes a workpiece, turned between centers, must be drilled, reamed, or bored on one end surface. In this event, the established center line is maintained by using a yoke to hold the left end on the live center, and a steady rest to support the right end.



The illustration shows how a yoke is employed to hold the workpiece firmly on the live center when a steady rest is used to support its other end. In making this setup, the workpiece is dismounted and the yoke is slipped over it. Next, the workpiece is remounted with the steady rest in place, and it is again in its original on-center position. The yoke is then bolted to the driving plate, and the fingers of the steady rest are adjusted to provide the workpiece with

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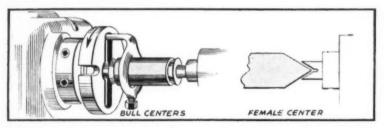


uniform support from all sides. When this is done, the tailstock is withdrawn and the workpiece is in the same oncenter position as when it was turned.

As a general rule, a face plate is substituted for a driving plate normally used in between-center turning. This is done because a face plate provides a better means of bolting the yoke in place. The yoke is provided with a stud at each end for this purpose. Care should be exercised, when tightening

the nuts on the yoke studs, to get an even pressure and not pull the workpiece to one side of the live center, in which event it will be drawn to an offcenter position. After this is done, and the steady rest has been adjusted to proper position, a drill, reamer, tap, etc., mounted in the tailstock spindle will cut on the exact center of the end surface of the workpiece and a boring bar, mounted on the tool-post, will bore a hole that will have a side wall of uniform thickness.

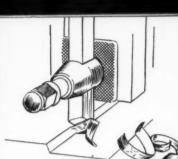
Tubing and bored workpieces in which the hole is too large for the regular centers, and workpieces that are tapered at the end, may be automatically brought to an on-center position for turning operations, by the use of special centers.



The illustration at the left shows cone-shaped or bull centers in use. The only difference between bull centers and the regular type is that their heads are larger. They are generally tapered to the same 60° included angle, and are made in various sizes to accommodate workpieces with holes of different diameters. Their shanks are always the same size, however, and fit into the live and dead center spindle holes. The diagram at the right shows that a "female" center, because of its tapered hole, will bring a workpiece that is tapered at its end, to an on-center position and hold it in place.

Female centers generally are specially made and should be bored or center-

drilled to an angle of taper that corresponds with that of the workpiece, so the tapered surfaces will seat uniformly. As a general rule, a hole is first drilled to a depth greater than that to which the taper will extend. Thus, when the tapering operation is completed, the hole is similar in form to that made by a combination drill and counter sink. and there is no danger of the workpiece riding on its point. Further, one tapered surface will seat itself securely in the other. If a hole is not drilled in a female center, as described above, even a slight difference in the angle of taper may permit the workpiece to ride on its point.



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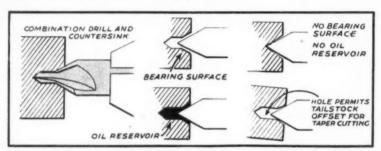
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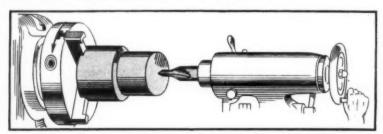
The center holes drilled in a workpiece that is to be supported between centers should be accurately drilled to a prescribed form to assure a maximum bearing surface in contact with the centers, and to provide an ample reservoir for a lubricant.

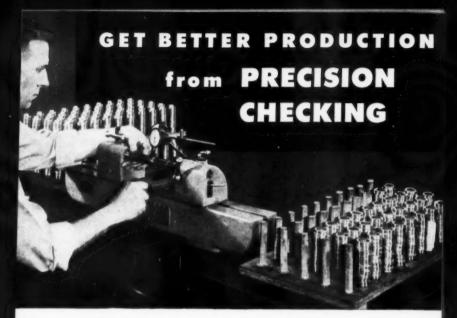


Illustrated above is a center drillwhich is a combination drill and countersink-showing how it drills a hole with a sidewall that is partly straight and partly tapered. The taper produced is at a 60° included angle, which corresponds with the taper of the centers. The illustration also shows that when this form of hole is drilled. the workpiece rides on the centers on a wide bearing surface. Thus, the workpiece is held securely, and any wear that may occur at the dead center can be compensated for by moving it in a little. In addition, a reservoir is provided to hold a lubricant which the non-rotating dead center requires.

Large center holes are generally first drilled with a regular drill, and then

brought to the proper angle of taper with a 60° center reamer, or a centering tool. When this procedure is followed, it is important that the drilled hole be deeper than the depth of the taper; otherwise, the center may ride on its point as the illustration shows, in which event the pressure of the cutting operation may push the workpiece off center as wear occurs. This cannot take place if the tapered surfaces are properly seated. Another advantage of a correctly formed center hole is that the frictional heat created at the dead center is distributed over the entire tapered surface: whereas, if a recess is not provided for the point of the dead center, all the friction will be concentrated on this point.





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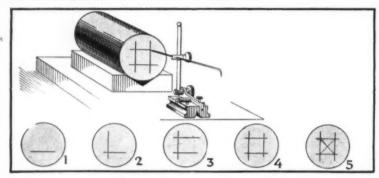
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The most widely used method of center drilling a relatively short workpiece is simple and reasonably accurate. The workpiece is chucked, and a center drill is mounted in the tailstock spindle. The workpiece is then rotated and the tailstock spindle is advanced as the cut progresses. Centering accuracy is dependent upon chucking accuracy, which, as a rule, is determined by the chalk method.

Absolute accuracy in center drilling demands that the center of the workpiece end surface be located and marked by one of the methods described below. When carefully marked, the workpiece may be center drilled on a drill press, centering machine, or a lathe. In the event that a drill press is used, the end surfaces should be squared off accurately, so the center holes will both be true with the center line of the workpiece. If this precaution is not taken, the angle of taper of the center holes in relation to the center line of the workpiece may not correspond, and the workpiece, as a result, will not ride true on the centers. This condition may produce excessive friction and wear on the dead center.

The axis around which a workpiece rotates is established by the location of the center holes. They should be drilled in the exact center of each end of the workpiece. The location of the exact center may be determined by any one of the following methods.



Here is illustrated the scriber method of locating a center. The workpiece is set on a V-block, which permits it to be rotated in a fixed position, and a surface gage is used to scratch four lines to form a square on the end of the workpiece, as shown. By drawing diagonal lines from corner to corner of this square, the exact center of the end of the workpiece is located. It will be where the lines intersect. This center should be punched with a center punch

and the center drill should be located exactly on this punch mark when the center hole is drilled.

Here is the procedure. Place the workpiece on the V-block and cover the end surface with layout fluid or chalk, so that scriber scratches will be visible. Adjust the scriber so its point will be a little higher or lower than the approximate center of the workpiece. Now scribe a horizontal line and then rotate the workpiece a quarter turn. Use a

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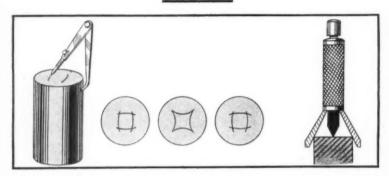
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combination square, resting on the base, as a guide by which to adjust the line just scribed to a vertical position. Then scribe a second horizontal line. Repeat this procedure until a square is formed. Lines drawn from corner to corner establish the exact center. Some operators

set the point of the scriber to ½ the diameter from the top or bottom of the workpiece and scribe a cross, the center being where the lines intersect. Best results are always obtained if both the V-block and the surface gage rest on a surface plate.



Another method of locating the center of the end surface of a cylindrical workpiece is to use a hermaphrodite caliper (commonly called "morphodite") in the manner illustrated. The approximate center should first be determined, and the caliper set so that its straight leg reaches either a little beyond, or a little short, of this center point, when the curved leg is set a given distance below the outer edge as shown. Four lines are then scribed when the curved leg is held at equally spaced points on the circumference.

Diagonal lines may be drawn from corner to corner of the scribed "box," otherwise, the eye is depended upon to

The center head and blade of a combination square may be used to locate the end center of cylindrical workpiece in the manner illustrated above. Because the blade bisects the angle of the center head arms, a scriber line drawn along the blade will cross the center line of the workpiece. If the center head is

locate the center of the box, which will be the center of the workpiece. This method, however, does not assure a high degree of accuracy, because of probable inaccuracies in locating the curved leg of the caliper on the circumference of the workpiece.

Another device is the "bell" center. This embraces a punch and a tapered section which fits over the end of relatively small cylindrical workpieces, as illustrated. When this device is used, it is important that the end of the workpiece be squared, and that the punch be held in a position parallel with the workpiece. If this is not done, the punch mark will be a little off center.

then turned so that a second line can be scribed at a right angle to the first, the center of the end of the workpiece will be at the point where the two lines cross.

This is the most widely used method of locating a center for three reasons: A wide range of workpiece diameters



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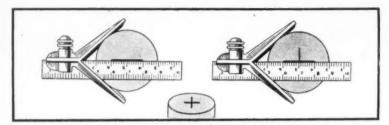
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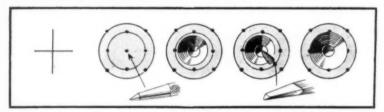
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can be accommodated with a given size center head, without having to make any adjustments; the procedure is so simple that the center can be quickly located; and the results are accurate, providing, of course, that care is exercised.

It must be remembered that regardless of the method used, any variation in the location of a center hole from the true center of a workpiece will establish a false axis around which the workpiece will rotate, and in addition, the end surface will not be square with this false axis. Therefore, care should be taken to (1) locating the exact center of the workpiece; (2) marking this center with a center punch; and (3) locating the point of the center drill exactly on the center punch mark.

The accuracy with which a center hole is drilled may be checked by circles scribed around the center punch mark. As drilling progresses, any deviation from center may be corrected by cutting a groove on the high side, which will bring the drill back to correct position.



When a workpiece is marked for center drilling, it should be carefully punched to provide a starting point for the center drill. Usually a dot punch is used. Because of its 60° angle, it is not likely to slip. The punch should be held perpendicular to the workpiece surface, so it will not glance off to one side when struck by a hammer. However, when drilling the center hole, the drill may "walk" to one side a little, and unless circles are scribed around the punch

mark as illustrated, there is no way of knowing this, or of correcting the inaccuracy. Two circles are generally scribed: One that will mark the circumference of the hole when completed; and the other, slightly larger, to check the location of the finished hole. Punch marks are generally made on these scribed circles as shown, because the scribed marks may be obliterated when the workpiece is handled.

When this practice is followed, the



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Five typical types of the 26 are illustrated.



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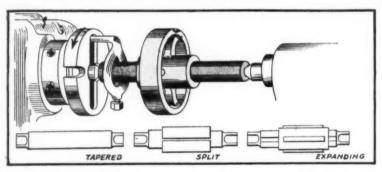
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end of the center drill should be located exactly on the center punch mark. And when drilling has progressed a short distance, the drill should be withdrawn so the location of the hole can be compared with the scribed circles. Should the hole, when partly drilled, be located a little to one side, a cape chisel is used to gouge out the opposite side so the center drill can move back to correct

position. Care should be exercised, however, when using a cape chisel, so the extent to which the hole is gouged out will be just enough to permit the drill to return the correct distance in the required direction. The hole is then drilled a little deeper, and a check is again made. This procedure is repeated, if necessary, until the center hole, when completed, is in the correct location.

Some workpieces such as pulleys, gear blanks, and bushings, must be machined concentric with a bored hole. In such cases, the hole should be bored or reamed first, and the workpiece then mounted on a mandrel, which is supported and rotated between centers.



A tightly fitted mandrel not only holds a workpiece securely, but, because it is accurately center drilled at each end, it will hold the workpiece on its true center line. Thus, any turning, facing, or recessing operations will be performed concentric with the hole in the workpiece. Illustrated above are three types of mandrels. Each is provided with a tapered section on which the workpiece can be accurately seated and securely held.

The center section of the mandrel illustrated at the left is tapered .006 inch per foot. It is forced into the workpiece hole. The other two are expansion

mandrels. Their shafts are tapered to correspond with the inside taper of a split collar, or equally-spaced shoes. In both cases, the collar or shoes are brought into position in the hole, and the tapered shaft is then forced into place by an arbor press, or driven into place with a hammer of rawhide, or some soft metal, to prevent marring the surface.

The expansion mandrel has one definite advantage in that collars of different sizes can be used with a given shaft member. Thus, a wide range of workpiece hole sizes can be accommodated.



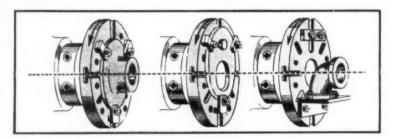
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Workpieces that cannot be chucked, or turned between centers because of their unusual shapes, may be clamped to a face plate, or mounted on an angle plate bolted to a face plate, so that the surfaces to be worked are concentric with the lathe centers.



A face plate is machined so that it will be square with the lathe centers when mounted on the spindle. It generally has four T-slots as well as four elongated holes to accommodate clamp bolts. Thus, regardless of the shape of the workpiece, the section upon which an operation is to be performed can be held in an on-center position. Workpieces mounted in this manner should be checked for mounting accuracy by one of the methods described.

When mounting a workpiece on a face plate, the operation to be performed determines how it should be mounted. For instance, if a hole is to be bored that is larger than the center hole in the face plate, metal pieces thick

enough to allow tool clearance should be placed between the workpiece and the face plate, close to the clamps. Further, if a heavy cut is to be taken and the outer edge of the workpiece is irregular in contour, it is well to bolt a metal piece to the face plate so it bears against the outer edge of the workpiece in a direction opposite the direction of rotation. This braces the workpiece against the pressure of the tool and prevents it from slipping. When an angle plate is used, it is good practice to bolt a weight, equal to that of the workpiece, to the face plate, at a point opposite the location of the angle plate. to act as a counterbalance.

Sections of large-diameter tubing and workpieces that have large holes, which have side walls too thin to withstand the pressure of chuck jaws, may be held in position for turning between centers by the use of a cone arbor.

A section of tubing, relatively large in diameter, for instance, brings up definite mounting problems: If chucked, the pressure of the jaws may result in distortion: if mounted on a mandrel, the heat generated by the cutting operation may cause the workpiece to expand sufficiently to permit it to slip. However, when a workpiece is mounted on a cone arbor, there is no danger of distortion.



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Sizes 1.510" to 6.010"

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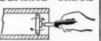
DuBo Gages weigh 70% to 80% less than cylindrical plug gages of equivalent size. Lighter weight means less fatigue, greater accuracy.

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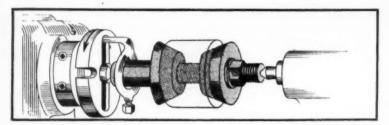
DuBo is entered easily by tipping handle slightly above bore axis (no jockeying necessary). Enters even under-sized bores easily.

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Enter gage, rock handle gently, bringing spherical gaging surface in contact with bore wall. Whether or not handle drops freely below center, is definite yes-or-no answer.

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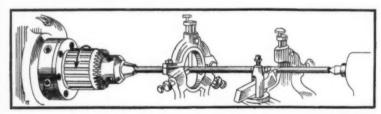


and expansion will tend to cause the workpiece to elongate, in which event it will tend to seat itself that much tighter on the cones.

A cone arbor is made up of a shaft, center drilled at each end, and two cones. One cone is held in a fixed position and the other is tightened by a nut, as illustrated. The cones are generally tapered to a 45° angle, which permits them to hold parts having a

relatively wide range of diameters. It is important that the ends of the workpiece be cut square, otherwise, it may seat itself on the cones in a position that is not concentric with the arbor shaft, and if a turning operation is performed, a slight taper will be cut. Care should also be taken in tightening the clamping nut. If it is drawn too tight, a thin - walled workpiece may be stretched.

Workpieces that are long and slender may spring away from the tool when turned between centers, or they may whip when rotated at high speed. Heavy pieces may chatter. Such possibilities can be avoided by the use of a steady rest or follow rest.



The need for support is not confined to long, slender pieces which tend to back away from the tool because of cutting pressure. Heavy workpieces that are long may also require support, because they may chatter if a heavy roughing cut is taken. Thus the amount of support required depends not only on the dimensions of the workpiece, but also on the nature of the operation. When a steady rest or follow rest is to be used, and the workpiece surface is

not smooth, a light cut should be taken first so the fingers will have a smooth surface on which to ride.

When setting up a steady rest or follow rest to support a workpiece turned between centers, care must be exercised to adjust the fingers so equal pressure is exerted on the workpiece surface. This is especially true in the case of a long, slender workpiece that tends to bend or back away from the tool. In this case a taper will be cut.

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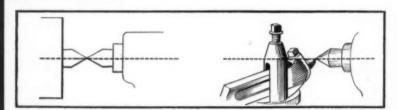
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Gear Shaper Co., Head Office and Export Dept., Springfield, Vermont. Branch Offices: 616 Fisher Bldg., Detroit 2...or 640 West Town Office Bldg., Chicago 12. If the operation is confined to one end of the workpiece, a steady rest may provide the desired support, but if continued for its full length—such as the cutting of an Acme thread on a lead screw—a follow rest is necessary. Being clamped to the carriage opposite the tool, it provides support at the point where it is most needed.

When a live and a dead center are in alignment with each other, their center lines must meet and form a straight line. When a tool is set on center, its point is at the same elevation as the center lines of the live and dead centers.



The alignment of centers calls for more than having their points in line. The centers themselves must be accurately seated in their respective spindle holes. Even a small piece of chip or dirt may throw a center out of alignment. Yet, after all possible precautions are taken, the relative position of the centers should be checked for accuracy. One method is to use a test bar. It is a carefully center-drilled bar, provided with collars of exactly the same diameter at each end. A dial indicator mounted in the tool-post may be brought in contact with both collars alternately, as the bar is slowly rotated. If no variation is indicated, the centers are in alignment.

In the absence of a dial indicator, the alignment of centers can be checked by determining whether a tool in a given setting position will contact both

collars. A very simple method is to take a light cut for a short distance at the headstock end of the workpiece. Then withdraw the tailstock and swing the workpiece so the tool can be run back to the tailstock end without changing its setting. A short cut is then taken at the tailstock end of the workpiece. If the diameters of both turned sections are the same, the centers are properly aligned. If any variation exists, regardless of what checking method is employed, the spindle holes and surfaces of the centers should be wiped to make sure no metal or dirt particles are present, and the tailstock should be adjusted laterally in the direction necessary to correct the discrepancy. This method of testing should be repeated until comparable results are recorded at both the headstock and tailstock ends of the workpiece or test bar.

Small workpieces upon which milling operations are to be performed on a lathe, may be mounted in any desired position by a device known as a milling attachment, which replaces the compound.



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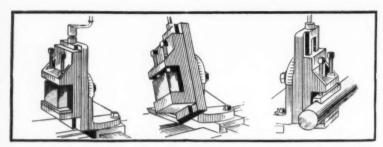
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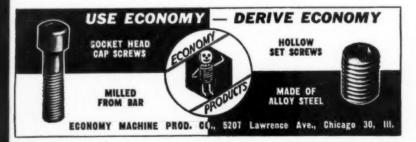


A milling attachment may be set to hold workpieces of almost any shape in whatever position is necessary to perform the desired milling operation. However, the size of the workpiece that can be accommodated is restricted to the capacity of the milling attachment, which is not great. And the milling operation that can be performed is governed by the size of the milling cutter that can be brought into working position. Usually the operations performed are confined to the cutting of key ways, T-slots, dovetails, etc., or, short vertical and horizontal milling.

End milling cutters may be mounted in the headstock spindle, or chucked in a drill chuck, depending upon the shape of the shanks. However, when cutting gear teeth, the milling cutter is mounted on an arbor rotated between centers. In this event either a special milling attachment is used, or a device with an indexing gear is held in place in the vise of the regular milling attachment. In either case, the gear blank is moved to the correct position for successive cuts as each tooth is completed. Due to the fact that the milling attachment replaces the compound, the workpiece can only be moved lengthwise and crosswise of the bed. But by these two directions of movement, it is possible to bring the workpiece into contact with the tool, and advance it as the cut progresses. Because the milling attachment can be swiveled, and tilted; and because the vise can be raised or lowered. the workpiece may be brought to any desired position.

The cutting lips of drills must be of equal length and must have the same angle to the axis of the drill. If one or both of these conditions are not met, the

chisel edge will not be centered and the drill will cut oversize. A scale should be used to check the lengths of the cutting lins





This adjustable tool holder will carry two Stems, either for turning or boring cuts, and in addition, a boring bar or drill may be carried in the center hole. The cutters are quickly set to the required diameters by moving the adjustable block up or down. The side scale and the micrometer dial under the ball crank contribute to quick and accurate settings which may be changed easily with the job. Two locking screws on either side of the block fix it solidly in the location desired. The adjustment range of the Stem holes is from 4 to 10" from the rotation center.

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RHODE ISLAND

New Plug Gage Simplifies Gaging Operation

Construction of a new plug gage and its application in inspection procedure is discussed.

Modern industrial techniques are making increasing demands for rapid and accurate dimensional checking devices, both for actual production and for the inspection of finished parts. To this end, the manufacturers of gages are constantly striving to improve their product, recognizing that no precision tool can ever be considered to have reached its ultimate in development.

The extraordinary demand for the production and inspection of precision parts during World War II both emphasized the importance of checking devices and stimulated their further improvement. It became increasingly evident that on the selection of particular types of gages hinged the important factors of quality of product, facility with

which the gaging operations were performed, and efficient production. The last mentioned factor is cited because it is important both to reduce the number of faulty parts produced and to keep those needlessly rejected at a minimum.

The considerable function which gaging has to accomplish applies also to the postwar era, because, as a result of the war experience, finer tolerances are being specified and are being extended to parts which were not previously controlled within close limits. The trend in gages to meet their increasingly important role has been toward more precise accuracy, lighter weight, long wearing characteristics, and more comprehensive scope as to what the gage reveals.

What is perhaps the simplest of gages, the cylindrical plug gage, has been subject to the improvements mentioned above. One of the advances over ordinary steel plug gages was that of surfacing materials, such as hard chrome

Fig. 1. Standard Double End DuBo Gage.



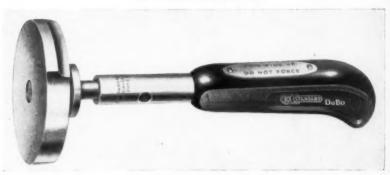
plating and tungsten carbide which have superior wearing characteristics. Another forward step was the addition of a piloting device which facilitates the entry of the plug into a bore. One form of this piloting device consists of a groove just back of the gaging end; the narrow rim thus remaining enables easier positioning of the gage before entering. To insert an ordinary plug into a hole which is only .0001" or .0002" larger than the plug diameter is a difficult task requiring careful manipulation and the pilot somewhat alleviates this difficulty.

The ease or difficulty of entering a cylindrical plug gage is of interest not only from the point of view of time required to gage a given number of parts but also from the standpoint of accuracv. This can best be shown by the specific example of a hole with a nominal 2" diameter and a tolerance of .001". the high limit specification being plus .00075", and the low limit minus .00025". If the hole is within the specified limits, it should be possible to insert the "Go" end of the gage, .00025" below the nominal 2" diameter but it should be impossible to enter the "Not Go" end. In actual practice, however, some holes

which are close to but actually above the low limit would be needlessly rejected, and some holes close to but above the high limit would be erroneously accepted, in both cases due to the difficulty of entering a cylindrical plug into a hole which is close to the plug diameter.

A development which avoids this particular disadvantage, and possessing other features as well, is a recent contribution to the field of plug gages, the DuBo Plug Gage, a product of the Standard Gage Company, Inc., Poughkeepsie, N. Y. This product belongs to the fixed limit classification of internal gages, the same as standard cylindrical plug gages. The DuBo Gage is based on the principle of using spherically shaped gaging surfaces, and of bringing these surfaces into contact (or potential contact) with the bore walls after the gaging member has been inserted in the bore. These gages use separate "Go" and "Not Go" members for checking the minimum and maximum allowable limits of the hole to be checked, similar to cylindrical plug gages. It is the practice to mount both members on a common handle, for sizes 1.510" and below, as shown in Fig. 1.







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For larger sizes, the members are mounted on separate handles as illustrated in Fig. 2.

Fig. 3 presents a diagram of a DuBo member. The spherical surfaces shown are made to within fine gage maker's precision, so that the diameter, D, of these diametrically opposed surfaces is equal to the minimum limit of the bore to be gaged in the case of a "Go" member. In the case of a "Not Go" member, the diameter, D, is, of course, made equal to the maximum limit.

The operation of the gage is indicated in Fig. 4, from which may be seen the method of using and the manner of obtaining the check. Holes may be classified on the basis of whether or not the

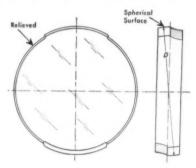


Fig. 3. Cross-Section of a DuBo Gage, indicating relieved portions facilitating ease of operation.

handle will drop of its own weight. This is a definite rule which eliminates the uncertainty of a "sense of feel," which fluctuates to such an extent between individuals. The gage operates with easy manipulations; strong-arm methods are not only not required but should not be used. Sensitive indications determined by light contacts supply all the necessary information.

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INVERTED CONE shape in HIGH SPEED GROUND BUR (Mustrated) and HAND CUT ROTARY FILE with 1/4" shank.



CYLINDRICAL FLAT END shape in HAND CUT ROTARY FILE (illustrated) and HIGH SPEED GROUND BUR with 1/4" and 1/4" shanks. CEMENTED CARBIDE BUR with 1/4" shank.



TREE RADIUS END shape in HAND CUT ROTARY FILE (illustrated), HIGH SPEED GROUND BUR and CEMENTED CARBIDE BUR with 1/4" shank.

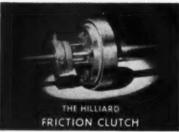


CYLINDRICAL RADIUS END shape in HIGH SPEED GROUND BUR (Hustrated) and HAND GUT ROTARY FILE with 14" and 15" should. CEMENTED CARBIDE BUR with 14" should.



NICHOLSON ROTARY FILES

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Areliable series of spring-loaded slip clutches and couplings made in a variety of types. Outstanding for-reeling and winding operations-tension drag brakes - limited torque-preventing overloads and shocks-starting heavy loads-and many other uses.



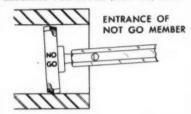
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For the new series of 0 illustrated Bulletins furnished FREE upon request Featuring our complete line of Industrial Clutches and Couptings-Over-Running-Single Revolution-Fection-Centrilugal-Overload Release-Stip.

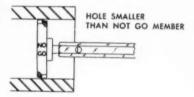
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126 W 41h 51 ELMIRA N Y
Manufacturers of
INDUSTRIAL CLUTCHES

It is obvious that the DuBo plug gage is much lighter in weight than the conventional type of the same size. In fact, for sizes above one inch, it is 70% to 80% lighter, a feature which is outstanding importance in reducing fatigue, especially in long run work.

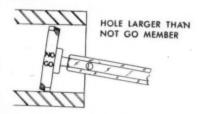
CHECKING FOR UPPER (NOT GO) LIMIT



"Not Go" Member (identified by red band) is entered in bore by tilting handle slightly above center.



If handle will not drop freely, hole is O.K. as far as upper limit is concerned.



If handle drops freely, hole is oversize and piece should be rejected.

ELEMENTS OF COST REDUCTION

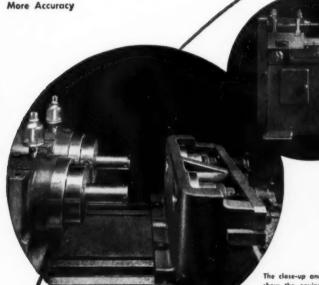
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SIMPLEX Machine Tools Division

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Precision Boring Machines, Planer Type Milling Machines and Special Machine Tools

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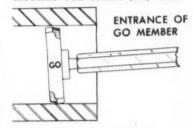


This set includes: one type A-1 holder; nine cutters from ½" to ½"; eight pilots from ½" to ¾"; two ½" countersinks, one 70° and one 82°, in hardwood box with hinged cover.

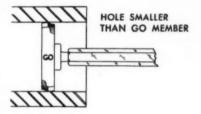


Another efficiency factor is the facility with which the gage enters into a bore. Due to the sides of the gage

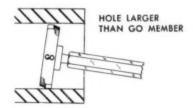
CHECKING FOR LOWER (GO) LIMIT



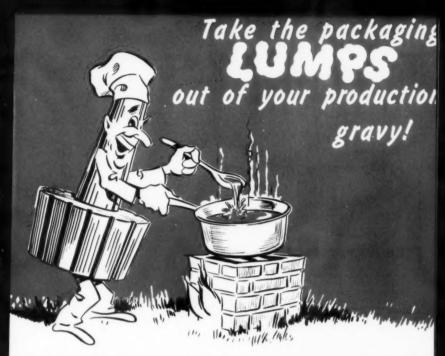
"Go" Member (identified by green band) is entered in bore by tilting handle slightly above center.



If handle will not drop freely, hole is undersize and not acceptable.



If handle drops freely, hole is O.K. as far as lower limit is concerned.



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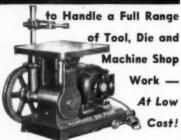
DIPPED—your product is ready for shipment. No excelsior, dunnage or other costly space consuming inner packaging required. DIPPED—your product is protected against rust, corrosion, condensation, chipping or scratching, moisture penetration, rough handling and tampering. Easily removed when desired—it peels like a tangerine.

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SEAL-PEEL INCORPORATED

NEED BOTH



The Milwaukee DIE FILER

is designed primarily for straight-line, sharpcorner filing, sawing and lapping in the softer metals preparatory to hardening. It is used extensively in the making of tools, dies, jigs and fixtures. It is highly efficient, sturdily constructed, has few moving parts. Adjustments are extremely simple. Saw overarm is quickly attached.



permits a high degree of precision in grinding interior and exterior profiles having curved, odd and irregular surfaces. It is especially adapted to the precision finishing of hardened steel parts. Spindle revolves at 20.000 R.P.M.. reciprocates vertically 100 times per minute. Takes grinding wheels from ½" to 1½" in diameter, Write For Illustrated Bulletins.

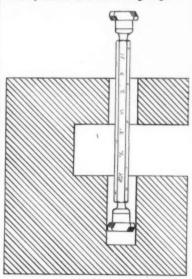
Both Machines are Stocked and Sold Exclusively by Industrial Machinery and Mill Supply Distributors.



being relieved, it can be entered into holes which are smaller than its gaging diameter; even into holes which are several thousandths of an inch undersize, the gage can be entered with no difficulty in positioning before entry.

Regardless of the working advantages of a tool, the ability to perform the job is of chief importance. In a gage, this means the ability to verify not only the diameter of the smallest circle which may be inscribed in the hole, but also

Fig. 5. Cross-Sectional Diagram indicating the checking of a blind interrupted hole by means of a DuBo Plug Gage.



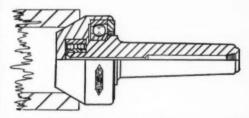
to detect variations in the diameter. To this quality should be added sensitivity of indication. It is a simple matter to detect taper, by the process of checking with the gage at several points along the bore. In this way, it is possible to discover tapers which extend outside the

182



LIVE CENTER adapted to Tube Turning

The basic design of the STURDIMATIC Live Center is ideally adapted to tube turning . . . extra large sections are no problem with this set-up . . . in most of these cases (see mechanical drawing) there is a tool clearance . . . Characteristic of all STURDIMATIC design is this low overhang which together with a slight cushioning action, that compensates for expansion, due to heat, shock and excessive thrust loads - reduces wear to a minimum . . . we will see that your job gets set-up with the right LIVE CENTER STANDARDS with Morse tapers (2 to 6) carried IN STOCK.



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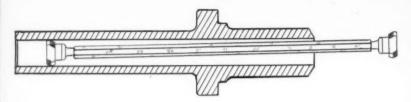


Fig. 6. Cross Sectional Diagram indicating how the DuBo Plug Gage checks a long hale.

tolerance zone, whether the taper enlarges toward or away from the opening into which the gage is entered. In the case of the latter, or back taper, detection is possible when it occurs in a hole being machined in a chuck. This condition may be readily detected by the use of the DuBo Gage before spoilage results. The sensitivity of this gage is partly a result of the ease with which it can be entered: these theoretical considerations are borne out in the actual use of the gage. The DuBo Gage minimizes the uncertainties at the tolerance limits, and translates a given value of the gagemaker's tolerance into greater accuracy of the product under test.

The use of gages is further complicated by the necessity of allowance for wear, due to the constant friction. This calls for frequent inspection; on large production runs, this should be done hourly, or at the most, every day, in order to ascertain that the precise accuracy of the gage be maintained, which is the final consideration in a tool of this kind. The DuBo gage is positioned for the actual gaging operation on other than the gaging surfaces, which are brought into contact with the bore walls only at the instant of making the check. Wear on the DuBo gaging surfaces is a receding process not affecting the entire area at once. A case is reported of

Fig. 7. Suitability of using a DuBo Gage for checking soft and nonferrous metals.

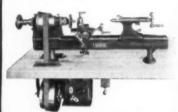








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"ELECTROBLAST" High Speed Muffle Furnace. Two excellent small sizes.



the gaging of machined holes in aluminum castings, a severe test of wear, because of the abrasive effect of sand in the castings. The DuBo plug gages were used to check some 8000 holes, yet their effectiveness was claimed to be unimpaired.

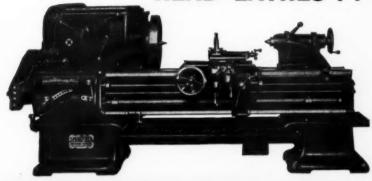
Although the DuBo Gage is used for measuring the standard varieties of holes which present no special features or problems, there are also specialized applications in which it is quite effective. Fig. 5 shows a blind interrupted hole, the size of the bottom of which was of critical importance. Difficulty was experienced due to a tendency of the reamer to "walk around", thus enlarging the bottom more than the portion near the entrance. It is a simple matter to gage near the bottom with a DuBo Gage independently of the remainder of the hole.

Fig. 6, showing a valve guide, illustrates how the Dubo Gage can be used for long holes. Due to the fact that the handle need be tilted by only a slight angle to enter the gage, it is possible to gage such a hole as the one shown. The length of bore which can be measured depends upon the diameter of the hole and the tolerance allowed. For this particular part, the DuBo was regarded of good advantage in checking the hole, since it was an easy matter to insert the gage and check several points along the hole. Moreover, the valve guide was checked after insertion in the cylinder block as well as before. With the guide inserted, there was access to the opening at only one end, and the ability of the DuBo to check back the taper was an advantage.

The light contact of the operation of the DuBo Gage makes it suitable for use with soft metals. Fig. 7 shows a bronze bushing in an airplane part being checked. The End.

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TOOL ROOM LATHES are equipped with Lead Screw Reversing Mechanism, producing right and left hand threads and feeds controlled by lever at right hand side of Apren, with automatic stops for both Lead Screw and Feed Rod. Oil Pan is also included as regular equipment.

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The direct reading Gear Box is tongued, grouved and boited to front of bed and is the enclosed type to exclude dirt and chips from gears. Wide gears and heavy shafts are used with Boll and Bronze Bearings throughout. Thirty-six [36] changes of threads and feeds are obtained, and in connection with the Reverse Gears, either right or left hand threads can be produced without the use of ween-ther.

SEND TODAY FOR BULLETIN 116

THE SPRINGFIELD MACHINE TOOL CO.

SPRINGFIELD

OUTO II S A

COLD CEMENT FOR POLISHING REQUIRES PROPER HANDLING!

Cold cements, so called because they are applied cold, have found such steadily increasing favor as a means of bonding abrasive grain to the face of polishing wheels and polishing belts that they have supplanted the use of glue in a wide range of applications.

These newer compounds require proper handling to provide maximum efficiency. The following tips and suggestions may prove of value to those finishing department foremen and shop superintendents responsible for setting up polishing wheels and belts.

The material should be kept covered when not being used. It requires no thinning, but may require occasional stirring, since it is specially formulated and mixed for slow-settling. A clean brush should be used for stirring-one that is free from glue or grease.

If the wheel or belt has been used with

glue previously, it should be cleaned thoroughly down to the cloth. When running a test on an abrasive cement, all old bond or lubricant should be removed.

When setting up a "bare" wheel or belt, the operator should apply a sizing coat of cement only, brushing it well

into the surface and using the cement unstintingly. Then the wheel is either air-dried at room temperature or forcedried under heat. Where wheels or belts have not been worn down completely in average polishing practice, no sizing coat is needed.

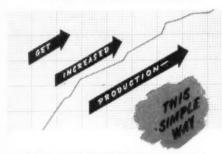
After coating is dry, the abrasive is rolled in using the same technique as followed in the case of glue, and again the wheel should be air or force dried.

Whenever desired for severe operations, a second "head" may be applied. A producer recommends that only one head be used for lighter work and for finer sizes, particularly for "oiling out" operations, but quickly adds at the same time in this connection: "Many operators find that 'two heads are better than one' on all jobs.

Time required for air-drying of wheels or belts varies from 3 to 4 hours to overnight, depending somewhat on the temperature and humidity of the atmosphere.

In many plants, higher temperatures and dryer air are being employed adand dryer air are being employed advantageously. Cold cement, unlike glue, may be dried very rapidly and at temperatures which would be definitely harmful to animal glue. Infra-red lamps are being used in commercial practice, with wheels being dried in 20 minutes.

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M. E. C. COLLAPSIBLE TAPS are manufactured in 3 styles—namely for . . . Turret Lathes . . . Drill Presses . . . and Automatic Machines.

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 - Costs **Eliminates Scrap**



Using water under high pressure and only one die section the new Hydrodynamic method permits the drawing and embossing of large and difficult shapes in one operation without localized draw strains.

Drawing and embossing sheet metal into shallow sweeps and shapes, as well as drawing cone - shaped and tapered stampings, can now be performed in only one operation. The new process, developed by L. V. Whistler and S. A. Whistler, Buffalo, and called the Hy-

drodynamic Process, utilizes water under high pressure instead of a mechanical punch to form the metal into shape. The water bulges the metal to the contours of the female die.

The equipment used for this method of working sheet metal is shown in Fig.

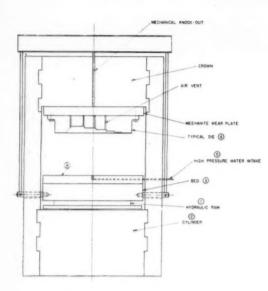


Fig. 1. The Hydrodynamic Process set-up for use on a general press.

1. A sample hydraulic press is shown which has the ram (1) and cylinder (2) in the lower portion of the press. Upon the ram rests a bed (3) and upon this bed is mounted an auxiliary bed (4) which has an opening (5) which connects to a hydraulic pump. Upon this auxiliary bed is placed the material

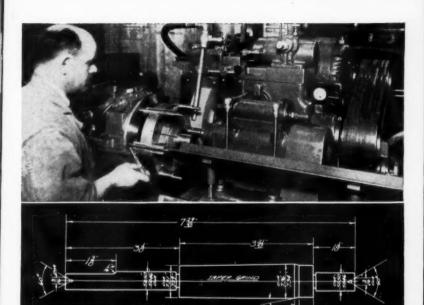
to be embossed under intense pressure.

The die is closed tightly on the metal, under sufficient pressure to prevent the material surrounding the embossment from movement while the embossing is taking place. Water under high pressure embosses the stamping to the outline of the female die with a fluid punch. This

Fig. 2. Water under high pressure embosses the stamping to the outline of the female die with a fluid punch.



MAT'L . . 031 18-8 ST'NL'S



ARTER for Shafts No. 135 Automatic Cylindrical Grinder

Automatic handling of work with plunge cut grinding. This highly productive grinder maintains concentricity of diameters as the work is ground on centers.

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Material . . . S.A.E.B. 1112 CR Steel. Stock removed012" average. Limits0004" on bearing diam-

Surfaces ground . . . three.

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ARTER GRINDING MACHINE CO.

WORCESTER, MASSACHUSETTS . U.S.A.

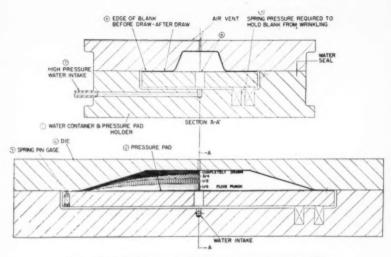


Fig. 3. Detail of water container and pressure pad holder.

method of embossing, where the material surrounding the area to be embossed is held from movement, is found to be the best method on shallow sweeps such as those shown in Fig. 2.

Part (1) in Fig. 3 shows a fluid container. It may be round, square, or rectangular depending upon the shape best suited to the stamping to be made. Part (2) is a pressure pad located in a

recess in the fluid container. It rests on a group of springs (3) of the proper pre-determined pressure to hold the material being worked, from forming wrinkles while being drawn to shape. A pre-determined blank (4) is laid on the face of the pad, nested by spring pin gages (5) and the press is closed, bringing the surface of the die (6) in contact with Part (1). The seal is metal



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SPECIFICATIONS—Navy bronze contact plate; Aluminum alloy case 4" x 4" x 10"; Weight 22 pounds; Recessed, heavy duty heat selector switch and pilot light; Handy cord storage compartment; Special current regulating transformer gives smooth etching action with the offset, coolgrip stylus. For operation on regular 110-volt AC lighting circuits. Fully guaranteed. Price \$67.50. Immediate delivery.

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Distance from slide to bolster stroke down, adjustment up is 9" center of slide to frame 7" opening through back 9½".

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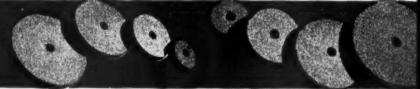
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DRIVE-ALL
TRANSMISSIONS

Fig. 4. Here is an actual die, water container, etc., used in producing this particular part in one operation.



to metal (no gaskets) and held by hydraulic pressure.

Water under high pressure (regulated according to the material being worked)

is then injected through the orifice in the fluid container (7), continuing on through the opening in the pressure pad (8). This "fluid punch" applies its



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Demagnetizer AC Portable Type Price \$15.00 F.O.B. Chicago

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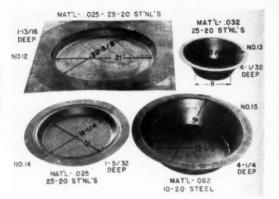
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Fig. 5. All of the stampings shown here were made in one operation by the Hydrodynamic Process. By mechanical means, such tapered stampings would be extremely difficult to obtain in one operation.



pressure to the greater diameter or areas first and diminishing down to the smaller diameter or areas causing the metal to flow or be drawn into the desired shape free from twist or warp. In Fig. 4 is shown the die, water container. and stamping produced.

Besides the obvious advantages of lowered die cost, lowered production costs, it is of interest to note that no



parts . . . Shows up in sharp relief-dries instantly—easily removed . . . Write for circular.

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localized strains are set up in stampings when this method is used. Large stampings which must maintain a smooth internal surface, free from draw marks, are easily made with the Hydrodynamic Process. The fluid punch exerts a uniform pressure in all directions. Fig. 5 shows a variety of parts produced by both the emboss and the draw method of the Hydrodynamic Process.

Metals which are difficult to handle

PRECISION DRAFTING MACHINE

Model J illustrated, with 10"x12" p. re s d w and d board, bronze bearings, calibrated parallel device, gradusted detection of technique designed designed

can be drawn and embossed without difficulty. Some aluminum alloys in their full temper or hardened state have been drawn into desired finished stampings, thus eliminating the heat



Fig. 6. The two stampings shown here, drawn from a multiple die, are 8 x 12 and made of 61 S W Aluminum Alloy.

treating and necessary re-strike or straightening when heat treated after drawing.

Materials up to 3/16" in thickness have been worked to date. The limit of thickness of materials that can be embossed or drawn by the Hydrodynamic Process has not yet been determined.

It is possible to draw two or more stampings with a multiple die and a water chamber with a multiple group of pressure pads. The two stampings shown in Fig. 6 are 8 x 12 from 61SW Aluminum Alloy.

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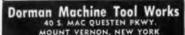
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Letter from England



The British Industries Fair now running in Birmingham and London has attracted a vast number of overseas buyers. The Birmingham Section is devoted to the heavy industries divided into four groups, hardware, building, electrical and mechanical engineering.

In the electrical group of exhibits production plant was shown in the form of arc and resistance welding equipment. Little in the way of machine tools was shown as most of the British machine tool makers will be showing later at the exhibition or-



ganised by the Machine Tool Trades Association. Measuring and gauging tools, presses and other sheet metal working machines, plastic moulding presses, etc. were exhibited.

A question recently asked in Parliament is likely to raise a point of interest to certain sections of the engineering industry and the medical profession. The question raised was whether the Medical Research Association had completed its preliminary enquiries into the effects of supersonic sound upon the health of workers engaged in the manufacturers of turbo-jet aero engines.

Apparently the Air Ministry is conducting investigations into this matter, and according to the Member of Parliament who raised the query a good deal of illness is being caused by these supersonic waves which are beyond human hearing.

The Conservative Party has just issued its plan for British



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industry, and the policy is to safeguard employee and employer and to put British industry into a position when it is not fettered as it is today.

The Government has a part to play but it must not be master of everyones' lives. The worker should receive better pay for better work. Controls should be abolished—not en bloc—but when the time has obviously come for removal they should be removed.

Safe-guarding of jobs is of paramount importance, and can be attained only by a programme of full production.

The Trade Unions have a definite and important position in industry and the Conservative Party is not opposed to trade unionism.

Restrictive practices are attacked. The party is against nationalisation, but cannot decide now whether or not any industry that does become nationalised will necessarily be denationalised later.

Speaking recently at the Annual Meeting of Craven Bros. (Manchester) Ltd., Mr. J. R. Greenwood, the Chairman, commented upon the difficulties under which his firm is labouring. Cravens are one of our largest firms of machine tool makers



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swivels and locks in any position. Can be varied 15½ by slight foot pressure, leaving operator's hands free. Engineered and built by tool engineers, experienced in production of special machines, dies, jigs and fixtures for exacting requirements.

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and during the past year their annual profits have fallen from £111,335 to £64,044. The firm has a full order book and there is no diminishment in the number of enquiries received from overseas. Today, however, there are several reasons for the profits drop in spite of the full order book. Costs of labour and materials have increased, there are shortages of supplies; there have been stoppages due to electricity cuts and there has been a failure to get back to the pre-1939 tempo of working, although Mr. Greenwood says that this latter factor is improving at Cravens.

During the past year the capital of the company has been increased in order to finance the cost of acquiring extended premises and the installation of new plant required for building larger and heavier machine tools than have previously

been made in this country.

One very heartening feature of the British Industries Fair is the display of mechanical handling equipment. This country is becoming more conscious of the value of mechanical handling of goods and materials, and British-built conveyors, stackers, trucks, fork lift trucks, mechanical shovels, dumpers



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and excavators were shown in great numbers.

Today when we must make the most of our labour force it is indeed pleasing to see the real effort that is being made to eliminate the wasteful man-handling of goods.

The trend of women's wages in industry generally is upwards, while those for men are more static. The average earnings of more than $5\frac{1}{2}$ million wage earners during the last week of October, 1946, were £5. 1. 0. or 90 per cent above the average for October, 1938.

In the engineering and shipbuilding trades a man's average weekly earnings are £6.12 9.

A wealth of figures on this subject is given in the Ministry of Labour Gazette, but if regarded superficially they are liable to be deceptive. Fluctuating labour forces, women changing from one trade to another, an increase in the number of women in industry, are all factors that must be considered and which obscure the real state of affairs if they are not given proper consideration.

Of course, although wages have increased there have been very substantial increases in income tax, the imposition of



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heavy purchase taxes and increases in local rates since October, 1938. All these have done a lot to off-set any advantage of higher wages, because not only must they be paid directly, but they also increase the manufacturers price of many goods so that even more money must be paid out.

. . . .

The recent annual report of the Central Electricity Board states that load shedding on a greater scale and over longer periods than during last winter is inevitable during the next two or three years. Nothing could be more definite than that statement coming as it does from a responsible organization well able to appraise the factors involved.

Industrialists are, therefore, looking for means to prevent the shut down of their works in the event of electricity cuts. The installation of private power plant will save the imposition of peak loads on to public power supply, will avoid night shifts and staggering of working hours; it will, not only provide the means of saving the suggested one third in current consumption required to reduce the risks of load shedding, but also provide the means of carrying on during cuts or total stoppage of outside electricity supply.



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Such private power plant can only under present conditions be based on prime movers of diesel engine type, and fortungtely this is the type which lends itself most readily to adaptation for industrial installations. If the engine is coupled to an electric generator all or part of the factory electric load can be carried by it, whilst by coupling it directly to a compressor or a length of shafting or a pump or other machine. an equivalent saving in electric current can be achieved. This adaptability of the diesel engine is enhanced by its compactness, by its press button motor-car-type starting, by the easy, safe storage and handling of the fuel oil on which it runs and by the self-contained nature of a complete diesel unit when fitted with radiator cooling.

High priority manufacture of diesel power units with and without electrical equipment has been sponsored by the Ministry of Supply with the chief aim of helping power users during the next three or four years. Release has been authorised of the material needed for a large programme to make available engines and electrical generators and switchgear at the earliest possible date and manufacture is already well in hand. The sizes of the diesel generating sets now being

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made are between 50 k.V.A. and 330 k.V.A., these sets being chosen after an analysis of the requirements of many factories and of available engines. Adequate supplies of the diesel fuel oil on which to run all thse sets are being assured by the Ministry of Fuel and Power.

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By the adoption of diesel power units to the needs of electricity users it is clear that a useful part of the deficiency between supply and demand of electricity can be covered, especially as the Central Electricity Board estimate this as being between two and two and a half million k.V.A.





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PRECISION MEASUREMENT



By WARREI BAKER

Section II — Instrument Inspection, Cont'd Part 12 — Inspection of Plug and Ring Gages; Introduction to Thread Measurement.

In this installment will be given the general methods for inspecting and measuring plug and ring gages, taper plugs, and plug and ring thread gages. In the latter case only the set-ups will be given, because the subject of actual thread and gear measurement is one of such length and complexity that an entire installment, next month, will be devoted to it.

The reader probably is aware that plug gages are used to check ring gages and ring gages are used to check plugs. Somewhere, however, there must be a criterion, so the plug, because it is easiest to measure with high accuracy, usually is the one used for reference in such work.

Plug Gages

Plug gages normally are available in three grades, master plug gages, which are used most often to inspect ring gages; inspection plug gages, used in final inspection work; and working plug gages, used on the production line. See photos A, B, C. The tolerance usually specified in each case is one-tenth that of the part they are to measure. They may be plain plug gages, with a gaging-section on one end only; double end gages, with one end go and the other end not-go; or "progressive" gages,

with the front part of the gaging section a go gage and the back part not-go.

In ordnance work the so-called "10 per cent rule" is used in their inspection. This means the go side will have an allowance of 5 per cent as a gage maker's tolerance. The not-go side will have only the 5 per cent gage maker's tolerance. This is because the not-go side is not supposed to enter the work and is therefore presumed to be not subject to wear.

Certain tolerances have been set up for both plug and ring gages by the American Gage Design Commission, however, which are given in Table I. Either these tolerances or the "10 per cent rule" are the ones used in most shops.

Class XX in the table represents plug gages for laboratory use; class X is for final inspection and work at very close tolerances; Class Z, plug or ring gages for use where tolerances are liberal; Class Y, ring gages for laboratory use in tool inspection; and Class ZZ, ring gages for general inspection or work with liberal limits.

The usual method of inspecting plug gages is much the same as that detailed repeatedly in the case of similar instruments heretofore. A stack of gage Photo A. Swedish bore gage with sapphire tips and dial type vernier. These must be set and inspected with master rings. (Courtesy Elgin National Watch Co.)

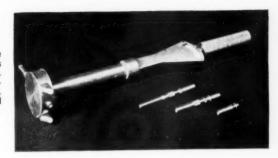






Photo B. Cutaway view of tungsten carbide-faced (carboloy) master plug gage, showing method of bonding carbide to shank. (Courtesy Lincoln Park Industries, Inc., Lincoln Park, Mich.)

Photo C. Master plugs and ring gages using boron carbide (Norbide) for the wearing surfaces. (Courtesy The Norton Company, Worcester, Mass.)



blocks may be wrung up with a wear block on each side, or they may be placed in the holder with caliper bars facing in, the distance between the bars the nominal size of the gage. The actual size of the gage should be measured by juggling the blocks and reading the dimension directly from them. The gage should be rotated to test for roundness. Again, if there are many to be inspected of the same size, or if tolerances are close, the nominal dimension should be set up with gage blocks on the comparator, and the plug gages measured there.

Plugs may also be measured by the

	Plug	Plug or	Plug or	Plug or	Plug
Size	Gages	Ring	Ring	Ring	Gages
	Only	Gages	Gages	Gages	Only
	XX	X	Y	Z	ZZ
.029 to .825	.00002	.00004	.00007	.00010	.00020
.0825 - 1.510	.00003	.00006	.00009	.00012	.00024
1.510 - 2.510	.00004	.00008	.00012	.00016	.00032
2.510-4.510	.00005	.00010	.00015	.00020	.00040
4.510-6.510	.000065	.00013	.00019	.00025	.00050
6.510-9.010	.00008	.00016	.00024	.00032	.00064
9.010	.00010	.00020	.00030	.00040	.00080

TABLE I

optical flat methods to be described in a later installment. Gage blocks are wrung together to the nominal size of the plug and at a suitable distance from it, the optical flat being placed over the whole. The pattern and number of fringes will tell you the condition of the plug and its size. Complete details will be given later on how to read the fringes. The setup is shown in Fig. 1.

The tolerance used in this sort of inspection is often confusing. The following examples are given to make these matters clearer:

Let us suppose the gage you are to inspect is one used to measure a 1 inch bearing, which has a plus tolerance of 0.001" and a minus tolerance of 0. If the go side of the gage intended to test this part were made exactly 1 inch, it



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would have no tolerance either for wear or for the gage maker.

According to the 10 per cent rule, therefore, the go side of the gage should measure as follows:

The limits for the go end of the gage, then, are 1.00005 and 1.0001".

In the not-go end of the gage, there is no allowance for wear, but there is still the gage maker's tolerance of 5 per cent, which is minus to stay within the tolerance limit. Computation works out as follows:

Total 1.00095"

The not go side of the gage, then, would be acceptable if it measured between 1.00095 and 1.001".

Ring Gages

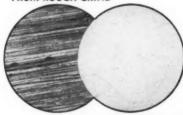
Ring gages are used on the produc-

Fig. 1. Inspecting plug gages with optical flat setup.



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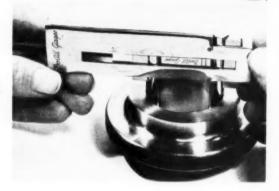


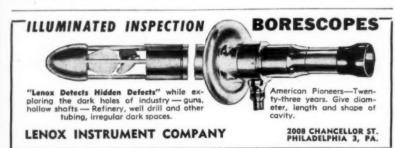
Fig. 2. Inspecting ring gages with gage blocks and round caliper bars.

tion line to test sizes of shafts, screws, or other parts similarly shaped and, in the laboratory, master ring gages are used to test plug gages, screw plug gages, and so on. There are several methods of inspecting ring gages for accuracy, depending upon the type, and the size, and the accuracy demanded.

Probably the simplest way to test a ring gage directly, if the dimension is large enough to allow it, is to wring up gage blocks in a holder with special round caliper bars on each end; put the master gage so constructed into the ring gage; set the blocks with the vernier block or by juggling them until you have a good sliding fit, then revolve the ring gage all the way around

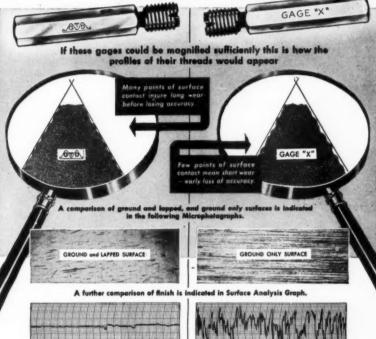
the master gage as shown in Fig. 2. If it goes all the way around without perceptibly loosening or binding at any point, you will know the ring gage is not worn out of round. You can then read the measurement from your stack of gage blocks and find whether the size is within the allowable limits.

If the ring gage is too small to allow such a procedure, you will have to use a transfer device, such as a telescopic gage or a small hole gage. In either case revolve it all the way around to test roundness, then transfer the mean measurement, if found round, or the high and low points, if out of round, either to a comparator or to a stack

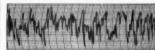


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Both gages will pass all measurement requirements. But the "Greenfield" Gage, because of its finely lapped surface, will outwear the other many times. All "Greenfield" Gages are lapped to an extremely high degree of finish. This "inbuilt" extra wear which gives long and accurate service and better value to users, is one reason for "Greenfield's" reputation in the gage field. For better gaging, "GO" Greenfield.

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These days, the lasting quality of Haskins Flexible Shaft machines is minimizing production difficulties and delays wherever they're at work. Many 20-

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haskins

FLEXIBLE SHAFT EQUIPMENT

of gage blocks wrung to a master flat with one projecting over the top as a caliper bar. If there are very many gages to inspect it will be found a great time saver to set up the nominal measurement with gage blocks on the comparator, or use the internal comparator shown in Fig. 3.

Fig. 3. Inspecting ring gages on the internal comparator. (Courtesy Pratt & Whitney Division, Niles-Bement-Pond Company.)



The same method of determining tolerances applies to ring gages, save that in their case the allowances are subtracted instead of added. For example:

You are to inspect a ring gage which is used to measure a shaft. The shaft is to be held within limits of .998 and .999". The computation:

Nominal size of ring gage...... 0.9989

The ring gage would be acceptable if made within 0.99895 and .9989" on the go side.

Since there is no allowance for wear on the not-go side, only the gage maker's tolerance of .00005" being allowed, the not-go gage would have to measure between .998 and .9985".

There are several points in this connection to remember: the finer the tolerance, the more wear there will be on the gage. Also, odd as it may sound in a softer metal, the gage will wear faster on aluminum than steel, because of the more abrasive character of the aluminum crystal.

Thread Gages

Because of the system of limits and allowances set up by the National Screw Thread Commission for plug and ring thread gages, direct measurement of thread ring gages is almost never made. Instead, master ring gages, which are adjustable, are made to mate with master plug gages and are then used to inspect plugs of lesser accuracy, and so on. What it all boils down to is that the master plug thread gage is usually the only one that is measured directly. A method of measuring a master ring thread gage will be given a little later, however, just in case you ever meet this problem.

Measuring Master Plug

One way to measure a master thread plug gage is to set it up under an optical flat and a magnifying light with gage blocks for reference, and measure it by the three-wire system which will be detailed in full in next month's installment. This may also be done on the comparator. This method will give you pitch diameter, the factor which usually is in doubt; major diameter, if you want it; and the included angle, if required.

Table II, herewith, gives the toler-

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TABLE II THREAD GAGE TOLERANCE

ances set up by the commission for plug thread gages. Only the W and X tolerances are shown, because the Y and Z tolerances are used only for the looser fits, not suitable for tool inspection.

Go working plug thread gages are made from the size specified to the plus tolerance shown in the table. Not go working gages are made from the given size to plus or minus one half the tolerance. Go working ring thread gages are made or set from the given size to minus the tolerance and not go thread ring gages are made from the given size to plus or minus one half the toler-

ance. Go setting plug thread gages are made from size to minus the tolerance, and not go setting plug thread gages are made to the size plus or minus half the tolerance. Gages made to accuracy W are for the inspection of Class 4 fits and those made to X accuracies are used to inspect Class 3 fits and for setting ring gages for Class 2 and 3 fits. Tolerances for fits of various classes and dimensions can be found in any good machinist's handbook. Master thread plugs should not enter not go rings more than 1½ turns.

The lead of the thread plug gage may

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The No. B-3 BEVERLY Bench Type Shear with Ball Bearing Hold Down handles 3/16" or No. 10 gauge stainless steel. This sturdy shear weighs 58 lbs. and is equipped with H. C. H. C. Blades for heavy duty service.

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A SELF CONTAINED, LOW COST, ROLLER BEARING





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Other HEIM products include UNIBAL Spherical Bearings, Spherical Bearing Rod Ends, Die Polishing Machines

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READING MACHINE CO.

READING (CINCINNATI) OHIO

be found with gage blocks and center points or dial gage set up in a holder as shown in Fig. 4 or wrung together

Fig. 4. Inspecting lead of long screw with center points, dial indicator, and gage blacks



without one. Pitch and lead both, however, usually are measured with a set of standard screw pitch gages.

Thread Comparators

Special comparator - type gages are made to measure master thread plugs and, if maintained to the proper accuracies, make possible a great saving in time on inspection work of this kind. They obviate completely the three-wire

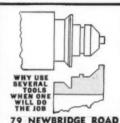
Fig. 5. Comparator type thread gage equipped with three points, for measuring pitch diameter. It may also be had with two rolls instead. (Courtesy Federal Products Corp., Providence, R. I.)



(or two-wire) methods of measuring threads, although it is still necessary on occasion to measure a master plug by this method so the comparator itself may be checked with it. A thread gage of the comparator type is shown in Fig. 5.

Master plugs may also be inspected

on the optical comparator or the tool maker's microscope. However, since gage blocks can be used to set up the dimension in only one direction on these instruments, the other dimension depending upon a micrometer screw measuring in ten-thousandths, any plugs made to tolerances closer than a ten-



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thousandth should be measured either on the electric comparator or under the optical flat by the three-wire system.

Taper Gages

Taper plug gages are measured for major diameter, minor diameter—which by most methods is utter guesswork taper per foot or inch. and wear.

The major diameter may be measured directly by gage blocks either wrung together with a bar projecting top and bottom, or placed in a holder with caliper bars as the gaging surfaces, just as with the plain type of plug gage. The best procedure, then, is as follows:

Wring a stack of gage blocks of the dimension of the major diameter to a master flat: place the taper gage in a cardboard jig so that its longitudinal axis is parallel with the long axis of the gage blocks and is a distance away equal to three times the thickness of the gage blocks. Place an optical flat over the whole setup under a magnifying light, just as you did with the plain thread plug gage. Formulae for figuring taper per inch or foot were given in Part 10 of this series. The pattern of the fringes tells the condition of the surface of the taper gage. By using methods to be given shortly in this series, you can also find the minor diameter of the gage, which is possible with exactitude by no other known method of direct measurement

Inside tapers are usually measured by comparison with outside tapers of known accuracy, unless they are where they can be reached and measured directly by the ball or pin system.

Taper Thread Plugs

The tapered thread plug gage, most often for use with pipe threads, can be measured by the optical flat and three wire setup sketched for regular plug gages. It may be necessary to measure thread by thread, but these gages usually are quite short, so this is not too onerous. Only by the optical flat method

can you get an exact measurement of the small diameter, and this is by far the simplest method of finding taper per inch. Pitch diameter, of course, is found by the measurements over the wires, to be explained in detail next month.

Inside Tapers

If inspection must be made of the taper ring gage, whether plain or threaded, there is one method that can be used with reasonable accuracy. This is to make a cast, either of 15 per cent graphite and 85 per cent sulphur, which is melted and poured so that an impression is made of the inside of the gage. The ring gage should be well lubricated, preferably with graphite, before the cast is poured, else you may have difficulty getting the cast out of the taper without breaking it.

The cast is then measured directly by the methods outlined heretofore. If a particularly accurate cast is required, use a mixture of Dentalloy and liquid mercury instead of the sulphur and graphite. In the case of a taper thread ring, of course, the cast will have to be screwed out after it has hardened, so some means of turning it should be cast with it when poured.

Such casts are particularly useful where inspections are to be made with optical thread comparators, but they can be measured, of course, by any of the methods given previously. Next issue: Measurement of Threads and Gears.

(Illustrations unless otherwise credited courtesy the DoAll Company).

Approximately 80,000 obsolete machine tools will be made available for salvage and scrap through competitive bid sales, WAA announced, explaining that the sale is designed primarily to permit salvage of scarce component parts such as electric motors, chucks, and circular tables.



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graduated dial...Criterion Heads are sold from coast to coast. Order from your local dealer. Request free literature.

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BEVERLY HILLS, CALIFORNIA

Large Overseas Attendance Expected at National Machine Tool Show

Buyers, engineers, industrialists and governmental representatives from every industrialized country abroad will be represented. . . .

More than 1,000 machine tools and related equipment will be shown, many in actual operation. . . .

Attendance is expected to reach 100,000. . . .

250 exhibits will involve 220 types of machines. . . .

When Charles Stilwell, president of Warner & Swasey Company formally opens the dinner of welcome to visitors from other countries on Tuesday, September 23 at the Palmer House in Chicago, U. S. A., he will address a huge audience of overseas visitors. From Europe, South America, Africa, Canada, Australia and the Far East, representatives of governments and industries will be gathered in Chicago for the National Machine Tool Show sponsored by the National Machine Tool Builders' Association. The show will be held from September 17 through 26, at the sprawling Dodge-Chicago plant.

Tremendous interest is being displayed in the show by businessmen. Due to the war, which disrupted and in many localities destroyed much of industrial Europe, a huge pent up demand exists for machine tools, accessories, and general metalworking machinery of all kinds. For this reason many leading buyers from other nations will attend the show with a view toward placing orders, at the same time using this visit

to America as an opportunity of renewing contacts with American manufacturers.

The high esteem in which American products are held is equalled by a healthy respect for U. S. production techniques. Engineers, industrialists, designers and production personnel will

TRANSPORTATION AND HOTEL RESERVATIONS

Reservations for the trip to America and hotel reservations while in America can be made through Thomas Cook & Sons, American Express or other travel agencies. Hotel reservations in Chicago can be made by mailing a hotel reservation to the Chicago Convention Bureau, 33 North LaSalle Street, Chicago 2, Illinois, U. S. A. Hotel reservation forms can be secured from importers of American machine tools.



View of the Dodge-Chicago plant, home of the Machine Tool Show, September 17 through 26.

attend the show for a resume of the technical developments which have taken place in the last eight years.

From England comes word that the British Ministry of Supplies, which controls import licenses, has revealed that dollars will be made available for the purchase of machine tools, and that official British representatives will have

TRANSPORTATION TO THE DODGE-CHICAGO PLANT

The site of the Machine Tool Show can easily be reached by bus or street car, taxi or private car. The transportation committee of the National Machine Tool Builders Association is working on final plans to provide transportation between downtown Chicago and the show site.

ply of dollars for machine tools, and has already made considerable purchases, plans to send a number of buyers and engineers, not only from import houses, but from private enterprises as well. French, Swedish, Swiss, Dutch, Czech,

Belgium, which has a sufficient sup-

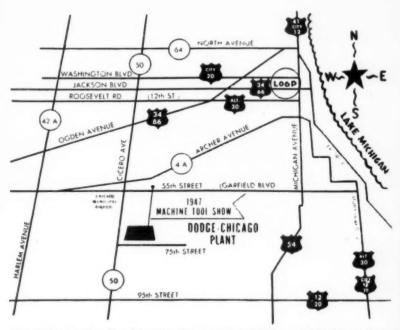
French, Swedish, Swiss, Dutch, Czech, Norwegian and other industrial representatives will be on hand.

South Africa, Australia and Canada will send its men, as will the countries of Latin America. In connection with the other American republics it may be of interest to note that some of their governments will grant import permits only for the purchase of machine tools; hence a large number of Latin American buyers will be in evidence.

GENERAL INFORMATION

The Machine Tool Show will be held in the Dodge-Chicago plant, the only factory building in the world large enough to hold an exhibit of such magnitude, from September 17 through 26.

authorization for purchases at the show.



Map of the Machine Tool Show site. Transportation will be provided between down-town Chicago and the Dodge-Chicago plant.

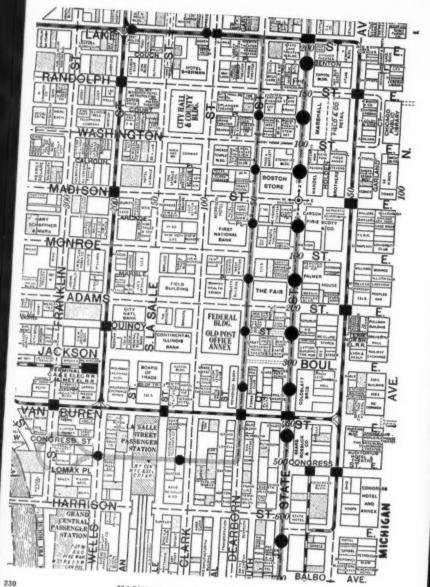
Map of downtown Chicago showing location of hotels, shops, and other points of interest. The outlined rectangle framing the downtown area is the elavated rapid transit system. The area within the elevated tracks is Chicago's loop.

More than 1,000 machine tools and related equipment and appliances will be shown in actual operation.

Exhibits will cover more than 500,000 square feet of space in the building, which now is being used by the Tucker Corporation (manufacturers of the new Tucker Torpedo automobile). The Show, the fourth to be presented by the National Machine Tool Builders' Asso-

ciation, will be more than double the size of the last show held in Cleveland in 1935. An attendance of 100,000 is anticipated.

"During the years of the war the emphasis was entirely on quantity production, which meant that machine tool models, for the most part, were frozen," Mr. Pease said. "New developments and techniques were evolved, however, and



this show will offer the first opportunity to display these latest advances in the art of removing metal."

TRANSLATOR SERVICE OFFERED BY HITCHGOCK PUBLISHING COMPANY

As a special service, members of Hitchcock Publishing Company will act as translators to visitors from other countries. Men who speak Spanish, Portuguese, French, German, Italian and Swedish will be available. Hitchcock Publishing Company's booth number at the Machine Tool Show is 662.

The housing of the exhibits in the Dodge-Chicago plant is of itself of importance because the building is an industrial plant and not an exhibit hall.

The plant has floors capable of supporting the heaviest loads required, ample power, and all the facilities for the operation of machine tools under working conditions.

According to the Association, there are some 220 types of machine tools made in the United States, with additional variations and sizes of each type, and combinations of various types, especially along the line of special-purpose machines designed for mass-production techniques. When to these are added forging machines, various other sorts of metalworking equipment, appliances and accessories, it is evident that the show will be "the world's greatest machine shop."

Concurrently with the show will be held the Machine Tool Congress, with nightly sessions at which papers and discussions will touch upon the latest



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developments in the metalworking industry.

K. H. Hobbie. President of the Chicago Technical Societies Council, is president of the Machine Tool Congress. Nine important associations will participate in arranging the program of speakers at the meetings, which will be open to registered visitors at the Machine Tool Show.

Included are American Bolt, Nut and Rivet Manufacturers' Association: American Foundrymen's Association: American Machine Tool Distributors' Association: American Society of Mechanical Engineers: American Society of Tool Engineers; Chicago Technical Societies Council: National Electrical Manufacturers' Association: Society of Automotive Engineers and the National Machine Tool Builders' Association.

A formal dinner of welcome to visiting executives from overseas will be

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held in the ballroom of the Palmer House on the evening of Tuesday, September 23. Charles J. Stilwell, president of Warner & Swasey Company, will be

VERANCE TOOL INDUSTRIES, Inc.

Saginaw, Michigan

toastmaster. There will be speakers of international importance representing government and industry.

722 lowe Ave.

Assignment of space in the show has been completed by the show committee headed by Swan E. Bergstrom, sales manager, The Cincinnati Milling Machine Company. More than 250 American manufacturers are represented.

Advance registration forms should be mailed to the National Machine Tool Builders' Association, 10525 Carnegie Avenue, Cleveland 6, Ohio.

Hotel reservations should be made by mailing the form to the Chicago Convention Bureau, 33 North La Salle St Chicago 2, Illinois.

Serving with Swan E. Bergstrom on the 1947 Machine Tool Show Committee are:

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William L. Dolle—President, the Lodge & Shipley Machine Tool Co. R. W. Glasner—President, Clearing Machine Corporation.
Helge G. Hoglund—Vice President, Van Norman Company.
Ralph J. Kraut—President, Giddings & Lewis Machine Tool Co.
Donald M. Pattison—Vice President, The Warner & Swasey Company.
Louis Polk—President. The Sheffield Corporation.

The Chicago Committee includes:

Rudolph W. Glasner, Chairman—President, Clearing Machine Corporation.

George Habicht, Vice Chairman—President, Marshall & Huschart Machinery

Edward K. Welles— President, Charles H. Besly and Company A. G. Bryant—Vice President, Cleereman Machine Tool Co. Harold B. Smith—President, Illinois Tool Works Norton A. Booz—President, Federal Machinery Sales Co. M. J. Wiora—Vice President, Bryant Machinery & Engineering Co. E. Porter Essley— Vice President, E. L. Essley Machinery Co.

On the Registration Committee are:

Helge G. Hoglund, Chairman—Vice President, Van Norman Company
T. B. Buell—Sales Manager, Sundstrand Machine Tool Co.
Kirke W. Connor—President, Micromatic Hone Corp.
E. Blakeney Gleason—Vice President, Gleason Works.
Frank Moran—Vice President and Sales Manager, The Carlton Machine Tool
Co.

Robert R. Rhodehamel-General Sales Manager, The National Acme Co.





NATIONAL MACHINE TOOL BUILDER'S ASSOCIATION ENJOYS COLORFUL BACKGROUND

The policy of laissez faire may be termed the reason for the birth of the National Machine Tool Builders' Association in 1902. The first part of the twentieth century was not exactly distinguished for "pink tea" treatment of one business competitor for another. Rather the reigning business policy common to all was that of survival of the fittest.

Machine shops had sprung up like mushrooms as a result of industrial expansion in the last decade of the 19th century. Every proprietor wanted as much business as he could get, and the average run of shop owners grabbed off what they could with little regard for ethics.

To alleviate the untamed, wild prac-

tices rampant, William Lodge, president of Lodge & Shipley Machine Tool Company of Cincinnati invited seventeen lathe builders to meet and talk over their problems. Fear and distrust, they had concluded, caused the back-biting, strong-arm tactics of the day. Lodge thought the solution lay in a friendly discussion of respective problems. Otherwise, the future of the machine tool industry was definitely shaky.

The seventeen lathe manufacturers endorsed the idea of association to promote the welfare of the machine tool industry by encouraging healthy friendship and an open discussion policy.

First officers selected were: Joseph Flather of Flather & Co., Inc., president; William Lodge, first vice-president; W. P. Davis of the W. P. Davis Machine Tool Co., second vice-president; P. E. Montanus, Springfield Machine Tool Co., secretary; and Enoch Earle of P. Blaisdell & Co., treasurer.

In October, 1902, at the first meeting after the formation, the roll call disclosed sixteen new members. Membership had grown to 33 and included not only the original lathe builders, but builders of milling and drilling machines, grinders and shapers. The Association was off to an auspicious start.

The first question brought up dealt with and opposed the adoption of the metric system—prohibitive cost of necessary new equipment, double standards for renewal and repair, and eventual high cost to the consumer all conspired against adoption.

The second meeting in 1903 saw advocation of standardization of parts to make interchangeability of tools, etc., casier. In 1920, work of standardization





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was continued by the American Society of Mechanical Engineers and American Standards Association who promoted the standardization of methods of machine tool building. To date, standardized spindle noses, table slots and openings for tool-posts, among other parts, have been adopted.

In 1908, the tariff question was considered at the annual meeting, and machine tool builders volunteered a tariff reduction to assist the national economy. After World War I, the tariff was revised upwards to stave off flooding of the United States with foreign made tools.

In 1930, headquarters were officially set up in Cincinnati with Ernest F. Du Brul as general manager and Frida F. Selbert as secretary. Mr. Du Brul devoted much time to the problems of the industry and he may be thanked for many improvements in current practice.

The present address is 10525 Carnegie

The manager is now Tell Berna, who accepted the post in 1936.

Present officers include president: Herbert H. Pease, president, New Britain - Gridley Machine Division, The New Britain Machine Co., New Britain, Conn.; first vice president: Alexander G. Bryant, Vice President, Cleereman Machine Tool Co., Chicago, Ill.; second vice president: Lloyd D. McDonald, Vice President, The Warner & Swasey Co., Cleveland, Ohio; treasurer: Louis Polk, President, The Sheffield Corp., Dayton, Ohio.

Officers of the National Machine Tool Builders Association

Herbert H. Pease

President, NMTBA

President, New Britain-Gridley Machine Div., New Britain Machine Company, New Britain, Connecticut.



Officers of the National Machine Tool Builders Association

Alexander G. Bryant

First Vice President, NMTBA

Vice President, Cleereman Machine Tool Co., Chicago, Ill.



Lloyd D. McDonald

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Swan E. Bergstrom

Chairman, 1947 Machine Tool Show Committee Sales Manager, The Cincinnati Milling Machine Co., Cincinnati, Ohio.





Tell Berna General Manager, NMTBA

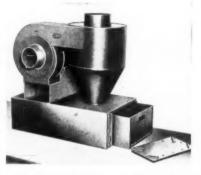
INDUSTRIAL DUST COLLECTOR COMPLIES WITH STATE CODES

Designed for collecting dust and lint from heavy duty polishing, grinding and buffing work, the Model 11N50 Dustkop is added to its line of industrial dust collectors by the Aget-Detroit Co.

The cyclone separator is provided with a stack connecting sleeve so that piping may be easily installed to convey the cleaned air out-of-doors. This design permits approval of unit type installations in states requiring outside exhaust, and prohibiting recirculation of cleaned air.

Powered by a 1½ hp motor, direct drive paddle wheel, self-cleaning fan, the unit develops in excess of 1500 cfm at 3.2" static suction on a 6½" diameter inlet, according to tests. The unit is claimed to be capable of handling heavy loads of shavings and chips from wood and metal-working, and lint and dust from polishing and grinding operations. Removal of the collected dust is by means of a drawer in the base of the unit, and aside from the removal of dust, no maintenance is required. Floor space for the installation

is 20" x 36", while the overall height is 35". With such limited space required, the unit can usually be placed immediately behind the machine it is to serve.



Further information on the 11N50 Dustkop is available from the Aget-Detroit Co., Main at Washington Sts., Ann Arbor, Michigan. Model 25 Hi-Duty Marking Machine

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Permanently

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The Pneumatic marking machine illustrated is our HI-DUTY model 25 general purpose tool for short runs or production work. It oper-ates from your shop air line and is one of numerous models built to produce neat, permanent markings quickly on metal fabrications. We will be happy to make specific recommendations upon receipt

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Kaufmann-Fabry Photo

by
H. L. Purdy
Editorial Associate, MACHINE and TOOL BLUE BOOK

As host to the National Machine Tool Show, this Midwest metropolis offers convention visitors a wide variety of attractions.

"Hog Butcher for the World, Tool Maker, Stacker of Wheat." Carl Sandburg, the American poet spoke truly when he wrote those lines about Chicago. Hundreds of barges of iron ore from the Minnesota pits converge annually upon the port of Chicago. Great steel mills and manufacturing plants: Inland Steel, Republic Steel, Youngstown Sheet and Tube, International Harvester, the Pullman Works, have

assisted in bringing Chicago to its greatness.

The thousands of square miles to the west are the heart of the American wheat belt—the prairie states of Iowa, Kansas, Nebraska, and Missouri. The ultimate destination of these millions of bushels of wheat is the mammoth grain elevators of Chicago. The Board of Trade Building is a world center for the buying and selling of cereal grains.

The nation derives most of its beef, steel mills and manufacturing plants:
Inland Steel, Republic Steel, Youngstown Sheet and Tube, International Harvester, the Pullman Works, have



Kaufmann-Fabry Photo

Fig. 1 Chicago's Michigan Boulevard, looking North. In the immediate foreground is Grant Park, to the left is the Stevens Hotel.

trainloads from that vast region. Their first and last stop is the Chicago Stock Yards. Meat-packing is Chicago's greatest industry; the great firms of Armour, Swift, Cudahy, and Wilson, form an industry vital to America's health and well-being.

Like Rome, Chicago was not built in a day, yet when one realizes that the great metropolis has existed only 114 years since its founding, its expansion seems little short of miraculous. Chicago is the second city in population (3,675,-000 in January 1947) and industrial importance in the United States, and the commercial metropolis of the West. Extensive water and air routes supplement the network of 32 truck lines of railroads converging upon the city,

making it a definite terminal point in the United States, and the greatest lake port in the world, as well as the greatest railroad center in the nation.

Chicago is notable as a convention city. Beginning with the Republican National Convention in 1860, at which Lincoln was nominated, nine U. S. presidents have been named in political conventions in Chicago. Its central location and its availability have made it a preferred location for expositions and commercial conventions of every conceivable kind. The strategic locale of the city has contributed considerably to its growth and development.

Chicago is situated on the west shore and near the southern end of Lake Michigan. It extends along the lake



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is an established fact that surface speeds ust stay up to approximately a mile a inute if you want to grind — not just rub. he speed of Kipp air grinders drops but ightly when put to work. That means etter work—longer wheel life.

uy Kipp air tools for best results, lower prices.



shore for 26.5 miles; the city covers a total area of 212.8 square miles.

In October 1871, the famous Chicago fire broke out in a barn, and fanned by a gale which spread it quickly, the conflagration raged uncontrolled for 48 hours. The fire destroyed 17,450 building, and caused over 200 deaths, besides great suffering and destitution. Out of a total city population of 324,000 at that time, more than 70,000 were rendered homeless, and \$190,000,000 of property damage resulted.

In 1893, Chicago achieved international focus for the first time, when the



Kaufmann-Fabry Photo

Fig. 2. The Chicago River, looking west, showing some of the drawbridges. In the center background is the Merchandise Mart.

World's Columbian Exposition took place. This great fair attracted over 27 million visitors from all parts of the globe, and was for that period, a remarkable and unprecedented affair. A

second international exposition celebrating the centennial of the incorporation of Chicago as a municipality was held in 1933. Known as the Century of Progress Exposition, it had a total paid attendance of nearly 40 million, and was extended a second year, due to public demand.

Chicago is the apotheosis of Industry. Its manufacturing plants include every conceivable industrial classification from the smallest machine shop to factories like the huge Chicago-Dodge plant where the National Machine Tool Builders Association Show will be held in September.

The city's great wealth and resources have made it a center of culture. Great

Fig. 3. Michigan Avenue Bridge, looking north. The gleaming white building on the left with the clock tower is the Wrigley Building, directly opposite is the Tribune Tower.

Kaufmann-Fabry Photo





Rouse
Fixture Set-Ups
that Speed Pro-

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It's easy to make light cuts—fast and accurately—on aluminum, brass, steel and other metals ... This high-speed, motor-driven unit is ideal for second operations on plastics. Anyone can quickly learn to run it. Rouse Fixture Set-Ups increase productive capacity for a large variety of small parts for electrical work, instruments, avigtion components, etc.

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universities, such as Northwestern, Lovola, and the University of Chicago. and numerous theological institutions have been established. Chicago supports a library system of great size, and sustains several reference libraries which are onen to the layman as well as the research technician World-famous museums, such as the Chicago Natural History Museum in Grant park, was founded and endowed as a collection of comprehensive scope, covering all fields of the natural sciences. Near by are the Shedd Aquarium, and the Adler Planetarium and Astronomical Museum. In Jackson Park stands the Rosenwald Museum of Science and Industry, which contains working models of machines in action. The Chicago Historical Museum in Lincoln Park contains a large collection of Americana pertaining especially to Chicago and the middle west: the Lincoln room in this building contains many possessions of the president. All

of these institutions are, of course, open to the public, and hold a wealth of information and interest.

The Merchandise Mart is another symbol of Chicago; this is a 24-story structure covering two city blocks, located at the confluence of the two branches of the Chicago River. Here manufacturers and wholesalers display goods to buyers, and hundreds of different lines are shown the year around. The Mart's importance is comparable to that of LaSalle Street in banking and finance, or to the Board of Trade in buying and selling wheat.

Chicago's great department stores, such as Marshall Field and Company, and Carson, Pirie and Scott are world famous; at reasonable prices, one may obtain goods of every conceivable sort. The city's celebrated hotels, such as the Palmer House, the Drake, the Stevens, and many others, are of high calibre. Restaurants catering to racial or

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CUTS ANY SIZE
CAPACITY UP TO 1/4" STOCK

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MARSHALLTOWN MFG. COMPANY



national groups serve the food of that country. The motion picture theatres, as well as the legitimate theatre, are numerous; many foreign language films are also available. Because of its large transient population, Chicago plays host to a world-wide audience the year around, and does it extremely well. THE END.

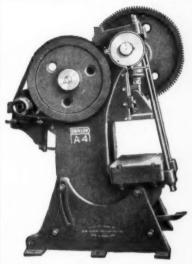
SHOPMASTER DIE FILER AND SAW

Master Products Industries announce a new tool, the Shopmaster Die Filer and Saw. The file is fixed in its vertical stroke, enabling greater precision. The table is adjustable and may be locked for precision angles or for cutting to exact lines. Either in filing or sawing, work can be inspected without readjustment. The overarm is removable for small internal filing, and can be used for a file support if desired.



The saw delivers 470 strokes of 1¼" per minute; the chuck capacity is ¼". Table top is 8" square. The manufacturers recommend using ¼" x 3¼" files. The housing, table, brackets, and drive disc are cast iron; the ram, drive shaft, and overarm are of carbon steel for wearing quality and rigidity. Additional information on the Shopmaster will be provided by Master Products Industries, 79 W. Summit Ave., Dept. BB, St. Paul 2, Minn.

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 - Speeds Up Dispersed Area Surfacing
 - Surfaces 4 Box Edges Simultaneously



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A Short History of the Machine Tool Industry

by William F. Schleicher

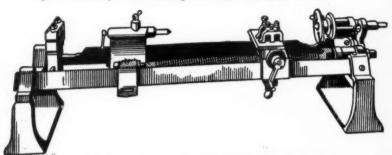
Editor, MACHINE and TOOL BLUE BOOK

Machines and machine tools were not always at our beck and call. Samuel Slater in 1790 fashioned the first Arkwright-type cotton spinning machine in America. In the back room of a clothier's shop he chiseled and hammered, and forged and fashioned to exact shape every pin, support and screw. And he fashioned each piece by hand, using hammers, chisels, files and crude, home-made devices that a modern boy would scorn to have cluttering his little work bench. America possessed no machine tools to fashion parts for Slater's spinning machine.

The early history of machine tools is primarily English and studded with countless luminaries. Maudslay in 1779 invented a screw cutting lathe, the great-grandfather of machine tools (See Fig. 1); Wilkinson, after tireless nagging (Much of this material appeared in the January issue of THINK Magazine, a publication of the International Business Machine Corporation. This material is here used with the kind permission of the editors of THINK Magazine).

by James Watt—that perfectionist who firmly believed a method could be devised to accurately bore out the cylinders for his steam engine—originated a boring machine (See Fig. 2). The earliest 18" dia. cylinders for Watt's steam engine were bored %" out of true. The difficulty of boring cylinders retarded the commercial practicability of the steam engine; with Wilkinson's boring machine, boring a 57" dia. cylinder only 1/16" out of the true, steam engines puffed their way into general usage.

Fig. 1. Maudslay's screw cutting machine, built about 1779.



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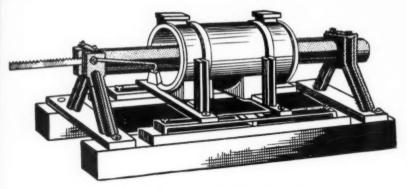


Fig. 2. Wilkinson's boring machine, invented ground 1780.

Then there was Joseph Bramah, who invented a new type of lock, having got the idea of his lock from ancient Egyptian patterns, and promptly conceived machine tools to manufacture the locks; Nasmyth, who invented a contrivance known as a "steam arm" . . . we now call them planers, and who is credited with the first index milling machines. The planer (1814) was the product of Murray and Roberts, presumably working independently. The planer had a chain driven bed 52" long and 11" wide.

Indeed, those were crude lathes, screwcutting and boring machines at the turn of the eighteenth century. And the method of supplying power to those early tools! A strap connected to a foot pedal by the machine and was wound around the workpiece and then connected to an overhead pole. The mechanic stepped on the pedal and the piece revolved, first forward, then backward. The cutting operation was performed during the forward movement. Some of the earlier machine tools were operated in this manner: the material which was being worked by the machine had a rope wound around it, which, when pulled, rotated the work, much like starting your outboard motor

today, except that every time the rope had unwound, it had to be rewound. Today's mechanic, flipping a button on a \$20,000 lathe, would shake his head in disapproval. But from such slight be-



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1/2 H.P., 110 Volt, 60 Cycle, 3450 R.P.M. 2 7"x1" wheels —1 coarse; 1 fine. Adjustable tool rests, wheel guards; eye shields. Factory Guaranteed.

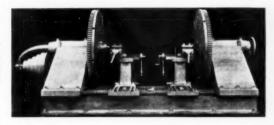
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Fig. 3. First model of Sellers locomotive driving wheel lathe, built in 1870. (Wm. Sellers and Sons Co.)



ginnings our modern machine tools emerged.

Yes, England had the machine tools; more important, she had the trained mechanics who knew how to use them. But she also had King George III, who had forbidden, under punishment of fine and imprisonment, the deportation of machine plans and specifications to America. Not until 1790 did the first

tides of immigration bring to the struggling America sorely needed mechanics with plans for machines and the fiery ambition to make them.

The time for the development of American machine tools was ripe. Inventions flourished from 1800 on. Eli Whitney revolutionized the cotton industry with the cotton gin; Fulton steamed his Clermont up the Hudson

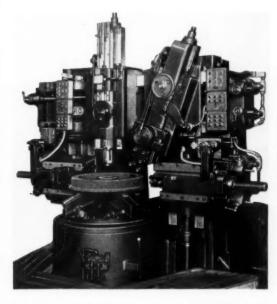


Fig. 4. A modern machine tool which cuts the diameter of rolled-steel car wheels to size. With this machine tool 6 car wheels are obtained in an hour. The center hole is bored while the outside diameter is turned. This machine is completely automatic. (Cincinnati Planer Co.

in spite of scorners; a railmaking machine was invented; Paul Revere rolled sheet copper; the first reaper was patented. In 1817 Baltimore streets were lighted by gas, and then came railroads, sewing machines, stoves, lamps and farm machinery. But to invent a machine is one thing; to produce all the parts to make it work required machine tools and something else—the theory of the interchangeability of parts.

Eli Whitney originated this theory and demonstrated its practicality. He went to Washington with all the parts for ten muskets. Dropping all the parts on a table, he requested the Secretary of War and a group of Army officers to assemble the muskets. In a flash the muskets were assembled. Any barrel fitted any stock. Regardless of trigger selected, it fit: every part was identical in size, shape and weight! This was revolutionary during an era when muskets were hand-made affairs: when a part wore out, a special part to fit only the damaged musket had to be made by hand. Whitney demonstrated that a machine tool could fashion thousands of parts, all alike and indistinguishable from one another. He manufactured these accurate musket parts with the help of a device which held the piece firmly in place while it was being turned on a machine tool. His assistant called it a "thing-a-ma-jig," and for the last 140 years mechanics have called any device which holds a piece of work a "jig."



Fig. 5. Milling machine-1884 model.

One of the machine tools which carved out hundreds of gun stocks with unvarying accuracy was the "gunstock" lathe, invented by Thomas Blanchard in 1820, thus practicing Whitney's theory. A cam on the lathe followed a prescribed pattern and copied gun stocks, wheel spokes and all kinds of

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Body Diameter—1½": length 1¾" Shank Diameter—½": length 1½"

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Hardened and tempered screw, tool block and shank.

Special Shanks Available.

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Fig. 6. Milling machine
—1946 model—with 16
different spindle speeds.

irregularly shaped pieces of wood. Subsequently this lathe was refined to work with metal. Today it is a highly respected machine tool. Whitney's theory of machine tools and the interchangeability of parts was particularly revolutionary because until his time all parts were made and hand-assembled in the same shop. By applying Whitnev's theory, triggers could be produced in Massachusetts, barrels in New York, gun stocks in Maryland and the complete gun assembled in New Jersey. But each shop required machine tools to fashion whatever particular part it wanted to supply.

From 1820 the development of machine tools followed behind each invention. Large lathes turned locomotive drive wheels to perfect roundness (Fig. 3 and Fig. 4). Hydraulic presses crunched out sheet metal locomotive

boilers with the ease of a cookie cutter. Huge boring machines dug out cylinders; and shears, like scissors cutting paper sliced off sheets of metal. With the invention of the milling machine, metal parts could be cut and shaved and formed into a variety of sizes—flat, concave, convex or irregular (Fig. 5 and Fig. 6).

But simply producing parts for steam engines, trains, wagons, farm implements and other machines was not enough. Accuracy was essential. The axles of locomotives had to fit the wheel; there was no jiggling this axle and that axle until one should slide home. Any axle had to match with any wheel. To achieve accuracy, grinders using an abrasive wheel were developed.

However, parts and machines must hold together. Hence, the drill, which

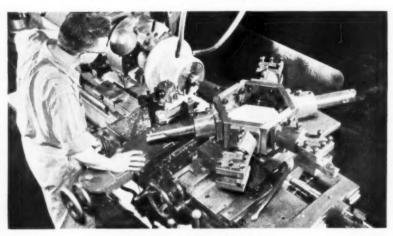


burrowed into metal as easily as a carpenter's bit drilled a piece of wood. Special machines then threaded the hole, and other machines made screws for the threaded holes. Still other machine tools made nuts, bolts, gears and other small parts. Fig. 7. One of the earliest turret lathes, then called "screw milling machine." So far as is known, it carried the world's first indexing turret.

Many companies entered industrial life by devising machine tools to make parts for new inventions. A lathe originally turned round pieces of metal to the diameter of small broom handles. Then some ingenious mechanic elaborated upon the lathe, enabling it to turn metal bars the diameter of locomotive wheels. When one company unfolded a horizontal boring machine to bore out cylinders, another righted it and got a vertical boring machine.

While the machine tools of the nineteenth century stood head and shoulder above the earliest machine tools, they were crude and slow compared to our modern machines. The automatic mechanism with which our modern operator controls the rate of work feed, machine speed, spindle speed—and thus, produc-





tion—was sadly lacking. Steam engines, which generated power, limited the number of machines which could operate at the same time. If every modern machine were thrown out and the type of machine used in the nineteenth century were substituted, our entire economy would grind to a stop!

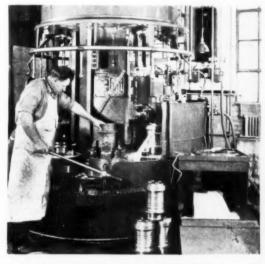
In 1851 a small, lightweight vernier caliper, making readings to a thousandth of an inch, and in 1867 the micrometer caliper were invented. What an improvement over antique, bulky bench models which a mechanic moved only with gravest concern for their accuracy. The micrometer caliper was followed by the optical comparator and by other precision measuring instruments. Today a millionth of an inch is measured more easily than the inch was measured in 1790.

Automatic machining was conceived during the middle of 1850, was developed during the balance of the cen-

tury and reached maturity in the present. A further refinement in automatic machining was the evolution of the turret lathe. One of the earliest models is shown in Fig. 7. Today's turret lathes (Fig. 8) perform multiple operations. Automatic and multiple machining was a great boost in supplying millions of parts which the automotive industry needed after it developed mass production with an assembly line. When the crankshafts, wheels, gears, rods, valves and steel bodies for an automobile were required by the thousands, the machine tool industry either had or developed the machines which would turn them out. One of the latest machine tools, recently announced by a manufacturer, will saw, mill, ream, tap, countersink, counterbore and burr 266 automobile rods per hour! (A modern machine tool is shown in Fig. 9.)

Does the industry provide jobs? In 1919, 53,093 persons were employed in the machine tool industry. This means

Fig. 9. This 8-spindle lathe bores the inside diameter and turns the outside diameter of 6 cylinders at one time. The machine weighs 48,-000 lbs. and cost \$50,-000. (The Bullard Co.)



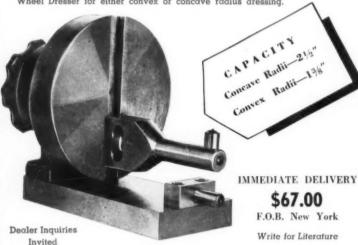
only those engaged in building the actual machine tools and does not include further thousands who were manufacturing drills, cutters, gears and other parts that go into machine tool making or the parts that are used with a machine tool once it is finished. In 1943, 299,000 persons were engaged in the manufacture of machine tools and 351,000 persons in the manufacture of accessories: drills, taps, dies, etc. The total value of machine tools produced in 1939

was \$166,649,000. That's a sizeable industry, large enough and specialized enough to manufacture all the parts for any new, atomic gas range or other startling gadget that might be invented.

It may be safely said that our progress would have been utterly impossible without machine tools, turning out millions of parts for automobiles, washing machines, radios, refrigerators, and other machines to manufacture shoes, overcoats, umbrellas and buttons.

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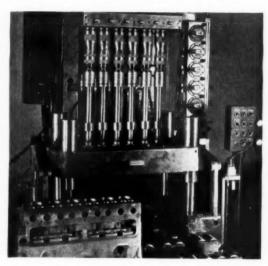
WHAT'S NEW IN METALWORKING

AUTOMOTIVE SIZE CONTROL OF AUTOMOTIVE CYLINDER BORES

To eliminate or reduce selective fitting of pistons in automotive cylinder the Micromatic bores. Hone Corp., has de-veloped a Honing Tool and Head that automatically controls the finished bore size. Fig. 1 shows a Barnsdril Honing Machine equipped with a Micromatic Hydrosize six spindle Head, Tools and Fixtures. In a honing cycle of 30 seconds, this equipment removes an average of .004" stock from each of the six bores, corrects out-ofroundness and taper, and holds bore to bore size to not over .0005" variation. The operator loads the block into the fixture and presses the button to start the honing cycle. The feed-out of the tool, the collapsing and withdrawal of the tool and the compensation for abrasive wear is entirely automatic.

It is standard practice, in production automobile plants, to manufacture and stock pistons in a range of sizes. As the blocks come to the assembly line, each cylinder is measured and a piston is selected to fit it. Since the fit of the piston must be kept within close tolerance, the greater the variation in bore sizes, the more piston sizes must be stocked.

Honing being the last operation on the cylinder bore, the Micromatic Hone Corp. has worked for several years to develop a means of keeping the cylinder bores to a uniform size. This has resulted in a new order of thinking in relation to control of bore size and accuracy, within close tolerances. Two Micromatic de-



velopments have made it possible to maintain this accuracy in production operations.

1. Controlled positive feed-out of the tool. The tool is expanded at a controlled rate by a hydraulic cylinder. This positive expansion may be adjusted so the high spots are honed before any stock is removed from the large parts of the bore. This results in the bore being straightened and made round with minimum heat and distortion.

2. The Hydrosize automatic size control. An Air Gauge is built into the Honing Tool. The pressure in the Gauge drops in proportion to the stock removed from the bore. When the pressure drops to a

modernize with these modern lathes



TRB S-56 PRECISION LAT

The modern way is the profitable way
. . . with the new lighter, handier, large capacity small lathes that pay accuracy
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large capacity small lathes that pay a profit from the first job and continue to pay every day. With 11½" swing and a 1½" hole thru the spindle the SHELDON TRB-S56 will handle the great bulk of every day turning, leaving the more cumbersome and costly lathes for the occasional really big work.

The TRB-S56 is extremely accu-

rate with "Zero Precision" tapered roller spindle bearings that make this accuracy permanent. It has double V-belts to the spindle and will take a healthy chip without power loss or slippage. It will do the closest tolerance tool room work, stand up on a tough production run, or handle the miscellaneous tasks of the maintenance department easily, accurately and profitably. It's a modern lathe you should know.

Write for Bulletin TRB-S56

SHELDON MACHINE CO. Inc.

Manufacturers of Sheldon Precision Lathes . Milling Machines . Shapers 4242 N. KNOX AVENUE . CHICAGO 41. ILLINOIS. U.S.A.

predetermined point, because the bore has been honed out to the desired size, the honing cycle is completed automatically.

The Hydrosize automatic sizing device operates as follows, —Fig. 2—Air is taken from the plant air line. The pressure is reduced to approximately six pounds p.s.i. This air supply is put through Venturi fittings into two circuits. These circuits are independent of each other except that any variation in the air supply will affect them both equally. The pressure in each one is controlled by the rate at which air is allowed to escape from it, and is not affected by the conditions in the other circuit. In one, the Control circuit, the pressure is controlled by a micrometer adjusted metering valve. In the other, the Gauging circuit, the pressure is controlled by two Caliper

Bars which measure the bore diameter. The pressure in the two circuits act on opposite sides of a diaphragm.

The orifices in the two circuits are adjusted so the pressure in the Gauging circuit is greater than that in the control circuit, when the bore is smaller than the desired size. As the bore reaches size this pressure drops below that in the Control circuit and the diaphragm is moved. The movement of the diaphragm operates an electrical switch which stops the expansion of the tool. When all six bores are to size the tools are collapsed and withdrawn.

Hydrosize automatic sizing may be adapted to all types of bores over 2" in diameter. Ports, undercuts, or heavy stock removal does not affect the accuracy of this type of automatic sizing.

ANODE ENGINEERING DEVELOPS RECTIFIER POWER SUPPLY

A selenium plate rectifier power supply designed for applications that require ripple-free output, is being produced by the Anode Engineering Co. Due to the special six-phase transformer bank and filter in this unit, the ripple voltage is less than ½ of 1%. The remaining voltage is that which is caused by unbalance in the three-phase line and random line voltage changes. The unit is designated as Anodex 354F. It employs an auto transformer of the continuously variable type; the main transformer bank provides isolation between the input and output circuits, the rectifier section and the filter section.

The unit is activated by the front panel push buttons, or it may be operated from a remote control station. The output voltage is adjusted by turning the voltage control knob on the front panel to the desired voltage as indicated by the voltmeter.

This product features high efficiency combined with extreme flexibility, with no service or maintenance costs. It is capable of operating at full ratings in high temperature locations, and standing severe overloads for short time durations. Its a-c input is 200 volt, 60 cycle, 3-phase; the d-c output is from 0 to 30 volts, 100 amperes. The steel cabinet is 48" in height, 22" wide, and 18" deep, and is mounted on a heavy steel base; the weight is approximately 300 lbs.

Further information regarding the Anodex 354F will be supplied by the Anode Engineering Co., P. O. Drawer 719, Dept. BB, Oakdale, L. I. New York.



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Also checks & concentricity without master & concentricity and size of worm gear & tooth spacing & backlash & parallelism & P.D. of any thread form with 3 wires diameter of gear and worm blanks plug gages, arbors, etc., as a comparator.

Showing method of checking worm gear for size and concentricity.



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You will eliminate from your payroll. many hours of highly-paid Machinists' time if you have these men use the JACK-SON TIME-SAVING VISE. It cuts out the time they are forced to waste hunting for Bolts, Clamps, Angle Plates, Parallel Strips, etc. when "rigging up" work on the Drill Press, Miller, etc. Furthermore, you can eliminate the simultaneous loss of output and overhead expense incidental to having your productive machine idle during the "rigging up" process. The four-side turret jaw and supplementary jaws enable the Vise to hold quickly. THE THOUSAND AND ONE SHAPES that arise annually in Machine Shop work. SEND FOR BULLETIN No. 23-B.











BROWN ENGINEERING CO.

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NEW PRECISION HOLE LOCATOR

The DoAll Company offers an instrument with which holes can be located and drilled on an ordinary drill press with an accuracy approaching that obtained on a jig borer. The DoAll Locator consists of two arms of hardened and ground tool steel at right angles to each other within thirty seconds of arc. At the exact vertex of the right angle is a ground tapered hole in which hardened and ground drill bushings are held by a bridge clamp. A vernier stop slides on each of the arms which are graduated for 6". The graduations are machine engraved by the most precise methods. The verniers are easy to read and set to less than .001.

The unique arrangement of two vernier stop slides at right angles to each other makes this tool easy to use. To locate a center two sides of the work piece are used as reference sides. The two vernier slides act as stops. When the slides are set to the required dimensions and the locator laid on the work piece with the vernier stops against the reference sides of the work piece the center of the tapered hole is at the exact location desired. The locator is then clamped to the work. By inserting the ¼" precision ground drill bushing and by using the special center punch furnished with the locator the desired center may be center punched accurately.



The center punch is made of hardened tool steel accurately ground to fit the ½" drill bushing. The point is ground to 120° included angle so that when centers are punched with it the bottom of the punch mark guides the drill when standard drills with 118° included angle are used.

Besides using the locator for center punching it may also be used directly as a drilling and reaming jig. The centers are located in the same manner. When the locator has been clamped to the work the proper size drill bushing is inserted and the hole drilled on a regular drill press with exceptional accuracy. The locator may also be used to advantage in locating pieces on lathe face plates or on angle plates. It may also be used for checking dies, jigs and fixtures.

The DoAll locator is made thruout of hardened and ground tool steel. It is a complete instrument in that no other measuring tool such as gage blocks or micrometers are required in using it. The locator comes in a hardwood box com-plete with assorted drill bushings, center punch and a pair of copper faced parallel clamps.

Further information may be obtained from the DoAll Co. Dept. BB. Des Plaines. Illinois.

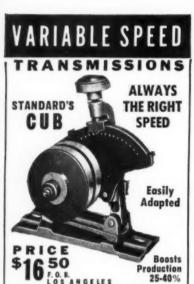
MAINTENANCE CLEANER ANNOUNCED BY PENNSALT

A new general purpose inorganic cleaner, designed for maintenance work but suitable for numerous other uses, has been announced by the Pennsylvania Salt Manufacturing Co. The new cleaner, designated Pennsalt MC-1, is a dry. granular inorganic material that dissolves quickly in water, removes most types of dirt and rinses rapidly. It is not a soap nor is soap necessary with its use.

Pennsalt MC-1 is designed for cleaning walls, floors, woodwork or windows; for general purpose janitor cleaning, for industrial washing machines, and for general cleaning in factories, and institutions. For industrial use, it may be used in steam gun cleaning of painted or un-painted surfaces. Two to four pounds of Pennsalt MC-1 is adequate for 50 or 55 gallon tank of the vapor spray machines. It can be used for metal preparation where a heavy duty cleaner would be too strong. The cleaner is not harmful to clothing or skin

Packed in 125 or 250 pound plywood drums, Pennsalt MC-1 is being sold, following extensive field and laboratory tests, by the Special Chemicals Sales Division. A leaflet on Pennsalt MC-I may be obtained from the company by writing to 1000 Widener Bldg., Philadelphia 7, Pa.





DRILL PRESS BRACKET \$1.50 EXTRA FEATURES

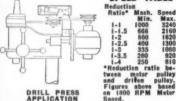
THOUSANDS OF SPEEDS AVAILABLE
3.3 - I SPEED RANGE WITH "A" BELTS
AUTOMATIC, POSITIVE BELT ALIGNMENT
SUITABLE FOR OLD OR NEW EQUIPMENT
SMOOTH-SIDED PULLEYS

MACHINED CAST IRON CONSTRUCTION FULLY GUARANTEED-LOW IN COST

THOUSANDS IN USE

SPEED TABLE

810



Speed. Made in five other sizes. Information on request.

New York, New York—Carl A Miller & Co. 134 Lafayetta St. Chicago, Illinois—Chicago Pulley & Shafting Co. 17-23 N. Desplaines St. Houston, Toxas—C. P. Williams Co. 2704 W. Dallas Ave.

Standard Trans. Equipt. 3407 Verdugo Rd., Los Angeles 41

BRADFORD CARBIDE TOOL GRINDER

The Bradford Machine Tool Co., Cincinnati 4, Ohio, is now manufacturing a Model 260 Carbide Tool Grinder. Mounted on the left spindle is a regular grinder for rough work, and the right side is for mounting of a cup wheel for accurate finish grinding. Work table is precision machined and is adjustable to desired angles and to height and wheel wear.

The grinder is equipped with an eye shield, tool tray, water pot, and wheel guards with exhaust connections. The



slope front is designed for maximum foot clearance.

The motor (220-440, 550 volts, 2 or 3 phase, 50 or 60 cycle) is totally enclosed to N. E. M. A. specifications,

NEW TOOL GRINDING FIXTURE

A new Universal Work Holding Fixture, which has four graduated quadrants permitting fast, accurate setting of any angle, is introduced by the K. O. Lee Co., manufacturers of "Knock - Out" cutter grinders. While designed for carbide and high-speed lathe tool grinding, the company reports that the tool is valuable for

other small grinding operations requiring simple and compound angles. The fixture is equipped with a 1½" vise (2" vise is available) and can be furnished to fit most standard makes of cutters or surface grinders. For complete details, write to the K. O. Lee Co., Aberdeen, So. Dak.

NEW AUTOMATIC CENTER PUNCH

An Automatic Center Punch with several new accessories has been developed by Vinco Products. Accessories include:
(a) tungsten-carbide point for punch marking hardened metals as well as glass, (b) self-centering attachment for lining up hinge or bracket mounting screws, (c) hole cutting points for paper and leather, (d) chisel point for tooling soft metals, (e) rivet point for light riveting.

When using the Vinco Automatic Center Punch, hand pressure is exerted, which releases a spring-actuated hammer that strikes the point with sufficient force to indent any unhardened metal. Two main types are available. Type C-15 (illustrated), adjustable to any spring pressure of from 9 to 20 pounds, possesses shock absorber action," assures precision, and prevents the distortion of light gauge

metals or delicate objects. Type C-12 is without spring pressure adjustment; the hammer is released at a pre-set pressure of 15 pounds.



Further information on the Automatic Center Punch and its accessories will be supplied by Vinco Products, 326 Bond St., Dept. BB, Asbury Park, N. J.



Send us your old drills—we'll make them new again at a fraction of the cost of a new drill! Exclusive NU-TANG* process replaces twisted or broken tangs with brand new tangs of correct size—and with GUARANTEED ORIGINAL STRENGTH. No welding—No distortion—No shortening of drills—No sleeves.

Any drill, reamer, or other tool with a Morse taper in sizes 2 to 6 can be repaired perfectly this quick new way. Delivery—One week. Used by many leading industrial plants. Amazingly low cost—satisfaction guaranteed!. Send for complete information.

*Patent Pending.

NU-TANGS INC. 1337 Bates Street Cincinnati 25, Ohio





An Arbor Press for every need, ranging from ¼ to 30 tons capacity, both hydraulic and mechanical types. Write for Catalog G.

GREENERD ARBOR PRESSES
NASHUA, NEW HAMPSHIRE, U.S.A.

DUAL SPINDLE POLISHING LATHE

A new line of polishing lathes for foundries, tool rooms and laboratories is introduced through the distributing agency of Ralph Hochman & Co., Newark, N. J. Model 400 is the first of five lathes of various sizes and types under the trade name of "Washed Air."

Hochman representatives say that the new lathe operates at low cost, in limited floor space. The machine is equipped with a self-contained dust collecting unit, and 1725 rpm motors of from ½ to 3 hp., which operate both the polishing head and the dust collecting units. "A" type link belting is used exclusively.

The manufacturers claim that under normal working conditions, it increases the salvagability of valuable pulverized matter due to its high efficiency. The polishing head and cover trays are of cast aluminum fitted with two sets of standard ball bearings on which the spindle shaft revolves.



Dust is drawn into the machine by a 4" duct in each collector. A removable receptacle on the intake side of the exhaust fan prevents any foreign object from being drawn into the system. The dust-laden air is cleaned by being passed through water, and is returned through three louvers in each side of the collector. Each wheel has its own dust collector. A

fabric dust-bag, immersed in water, on the exhaust end of the fan housing, can be removed and cleaned. Ample room for two operators at each machine, and brilliant hood-lights are provided.

DENISON DIAL FEED TABLE FOR

Faster and more efficient feeding of small parts to the pressing station of the Multipress is now possible, using the new Denison Dial Feed accessory. This dial feed provides a mechanical type of operation, with the dial being actuated with each retracting stroke of the press ram, by mechanical linkage which is connected with the banic type arm on the ram.

with the banjo type arm on the ram. By adjusting the actuator, the ram stroke can be changed to provide 8, 12 or 24 indexes per dial revolution. Regulation of the indexing stroke for correct positioning of work beneath the ram is obtained by adjustment of a hexnut. Action is positive and smooth, and when a short ram stroke is used, high production rates can be maintained. Provision has been made for ejection of the finished parts beneath the table, by removing a section of the table casting.

Since tooling is required at the pressing station only, a great savings is effected over index tables requiring complete tooling at each station around the dial. Tooling can be easily installed and quickly removed, making it useful for short run



operations. Additional information by writing the Denison Engineering Co., 1160 Dublin Road, Columbus 16, Ohio.





DUBLIFE PLUG GAGES WITH COLORED PLASTIC COLLETS



GREEN

RED for





Remember! — Colored Collets instantly identify plugs. They are weight reducing. lock securely and will not mar the finest finish.

United Precision Plug Gages are scientifically designed. They are made by skilled craftsmen from the finest gage steels. The latest in modern equipment for metal working and heat treating assures a high standard of perfection—dependable accuracy, maximum service at minimum cost.

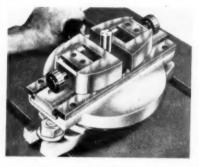
UNITED PRECISION PRODUCTS CO.

SHABONNA, ILLINOIS

VISE CENTERS WORK OF VARIOUS DIMENSIONS

A self-centering, double cam actuated vise which centers the work to the drill or cutter regardless of the dimensional variation of the piece, has been introduced by the Williams Products Co., of Middletown, Conn. The self-centering feature is of particular advantage with castings, forgings, and similar types of unmachined blanks. Single hand operation and locking permits faster usage and greater efficiency.

The frame and carriage are machined from iron castings; the cam plate is alloy steel. The cam is machined after heat-treating to insure smooth operation and long life. There are no bearings to oil or grease. The machining is held to close tolerances, and the jaw blanks



ground for squareness which allows the vise to perform secondary operations at high speed, wih a minimum of maintenance.

Through the center is a 3" opening which allows the work and chips to fall clear when the cam lock is released, with suitable clearance for placing a work-tray or chute under the vise.

ELECTRIC MARKING TOOL WRITES

An addition to the New Britain line of hand tools is their new electric tool marker. This 13-ounce tool writes with the ease of a pencil, cuts initials, names, and designs into hard surfaces. According to the manufacturer, it quickly and permanently engraves metal, glass, wood, or plastic. The marking tool vibrates 7000 strokes per minute, and contains a knurled adjusting collar to vary the

stroke intensity.

The tool is carefully balanced for comfortable holding and handling. Mechanics will welcome such a means of identifying tools. The marker, with five foot cord and plug, comes in two models, for a-c only; model TM-115-60 has a special hard alloy



point; model TMD-115-60 contains a diamond point. Further information is available from the New Britain Machine Co., South St., New Britain, Conn.

STEEL STOCKROOM SHELF BOXES FOR SMALL ITEMS

For the storage of small bulk parts in stockroom, assembly department, show and sales rooms, Bay, Inc., 3003 No. 16th St., Philadelphia, Pa. has developed a new steel shelf box. Their plain, straight sides allow compact arrangement and maximum use of limited storage space. Because of their smooth surface, the boxes will not adhere to the self or to each other; likewise, they can be removed or shifted with a minimum of effort. Label holders on the front of each box make identification of contents easy, speeding the handling of materials. These steel shelf boxes are available in standard gauges and sizes to fit all standard sizes of shelving.

UNIVERSAL BUFFING AND POLISHING WHEELS

The Universal Wheel & Abrasive Corp. announces the addition of a line of buffing and polishing wheels to its list of products. Consistent with its policy of offering first-class products to industrial consumers, Universal has developed various types of buffing and polishing wheels to meet varying polishing conditions. Universal engineers are prepared to develop the proper buff in the consumer's plant, and on the consumer's own machines. For further information, write to the Universal Wheel and Abrasive Corp., 400 No. Ashland Ave., Chicago 22, III.



time and expense!

A big improvement over single-point stones! When the diamond cutting surfaces wear off, you don't send this dresser out for re-setting—instead, a simple \(\frac{1}{2} \) turn in the holder presents a new layer of diamond points—ready to go to work at once! You save the expense of re-setting—you save time, too (the dressers never leave your shop). And you get uniformly fine dressing because dresser efficiency doesn't depend on the unpredictable quality of one stone, but upon the average of MANY.

Layer upon layer of selected industrial diamonds are anchored in a special Carboloy Cemented Carbide matrix to prevent accidental diamond loss. Particles large and small are held securely throughout dresser's entire useful life.

Available in 3 sizes for rough, semi-finish and finish dressing. Economically-priced. Investigate this money-saving method at once—leaflet SA-127 answers all questions—write for it today.

CARBOLOY COMPANY, INC. 11139 E. 8 Mile Blvd., Detroit 32, Mich.

Also Sold By Leading Mill Supply Distributors

CARBOLOY



NATCO DEVELOPS PRECISION BORING MACHINE

The new Natco A-20 BorFace Machine developed to speed question of precision boring in large hard-to-handle castings and can be used by semi-skilled operators.

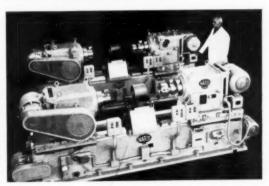
The new NATCO Machines consist of either A-20A (illustrated) or A-20B model units which may be mounted horizontally, vertically, or at an angle in fabricating multiway type precision boring machines. The only difference between the models is that the "B" unit provides an automatic cross - facing

drive and control which is inserted between the rear end of the spindle unit and the spindle drive motor.

Natco A-20 BorFace units are provided with heavy-duty spindles mounted on pre-loaded precision bearings, with worm and gear driven by "V" belt drive to insure smooth flow of power to cutter bits. These units cover a field in large bores not previously handled by production way type machines and enables the handling of work too large and awkward to handle or swing on boring mills and lathes. The A-20B type unit also permits operating on more than one face at a time through way type application thereby insuring greater precision and eliminating rehandling or resetting between operations.

The two new NATCO A-20 "A" type Machines illustrated show a recent installation. These units are arranged to rough and finish bore a range of 8 sizes of cast iron N.E.M.A. frame motor yokes with a minimum central bore of 7" to 11½" diameter and counterbore from 9¼" to 14½" diameter. Depth of counterbore is 3/16". A. C. drive motor for spindles is used on the machine in foreground for rough boring, counterboring and chamfering.

The machine in background is the same except for D.C. variable speed drive to permit wide range in spindle speeds for the highest cutting efficiency and finish in final boring and counterboring operations. Production on this job varies depending on size of the motor frame from 8 to 24 parts per hour with limits on



bores and counterbores held to plus or minus .001" for both size and concentricity.

Various types of work heads may be employed which are designed especially for work requirements. These heads may permit a combination of turning, boring, cross-facing, undercutting and other operations.

A feature of the application illustrated is the use of standardized bit stock either high speed steel or alloy tipped standardized bit stock. This reduces tooling costs and sharpening time to a minimum. This tooling set-up also eliminates the need for large expensive bump facing cutters with their elaborate detail. Data sheets are obtainable without obligation from Dept. 24, National Automatic Tool Co., Inc., Richmond, Indiana.

MOORE MICROSCOPE PRESENTS IMAGE IN NATURAL POSITION

A new locating microscope which reverts the image to upright and easily picks up edges, contours, irregular shapes, and holes too small for an edge finder or indicator has been developed by the Moore Special Tool Co., Inc., of Bridgeport, Conn.

An optically engineered precise roof prism in the Moore Microscope enables the operator to see the work in the same position as without it. Table settings can be made instinctively without the confusion of transposing reversed or inverted 'able movements as in conventional microscopes.

In addition to a double pair of cross

line, spaced .001" apart, the Moore reticle contains a large number of conveniently spaced concentric circles whose lines are broken to facilitate locating small holes or large radii otherwise covered by the line.

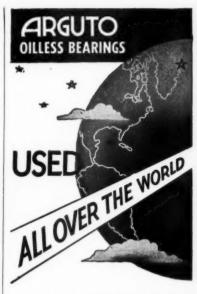
Magnification of 40x, enough to see a "tenth", is achieved without unduly reducing the field of vision or making adjustments too critical. The Moore Microscope provides a field of vision wide enough to include a large portion of the work piece (a full ½"), simplifying the picking up of a reference point.



Designed for use in the Moore Jig Borer or Moore Jig Grinder, the Microscope extends the usefulness of either machine by converting them into inspection machines for hole location, contour shapes, finish or surface conditions. Locational accuracy is quickly determined by substituting the microscope for the cutting tools or grinding heads and work may be checked without disturbing the set-up in the machine.

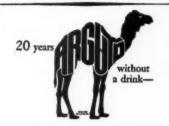
With a suitable shank or adapter, the Moore Locating Microscope may be attached to any machine or inspection tool requiring an optical pick-up device.

"The machine tool industry has been the forerunner of progress in this country in the past and will continue to be so in the future. One of the major factors in the progress of this country is the action of the machine tool builders." Thos, J.



... IN MANY DIFFERENT APPLICATIONS

"OUTWEARS THE BEST BRONZE METAL"





Do you make plastic molds?

- Cerro alloys are successfully used in making molds for casting plastics. Low temperature setting plastic materials can be cast in molds of Cerrobase 255° F. or Cerrotru 281° F. These molds may be made inexpensively by either spraying or casting.
- 1. Sprayed molds—best for models made of non-metallic materials, where heat conduction is poor. But can be used for metal models also. Alloy is sprayed directly on model. Full information for this process given on request. Since Cerro alloys are non-shrinking, surface detail and dimensions are accurate and no polishing is required.
- Direct cast Cerro alloy molds—models made of good heat conductors are easily reproduced in molds by casting alloy directly against them. Full information on request.
- 3. For models with undercutsmold can be cast in sections or produced by electroforming. By latter process, difficult surface contours can be molded by first investing model in flexible molding material such as latex. Then flexible mold is stripped from model, supported in plaster and Cerrobase poured in, producing a true metallic positive. positive is electroplated and the Cerrobase melted out. The mold shell is backed up with suitable material. Full information about this method on request.

Information available on spray guns will be furnished on request.

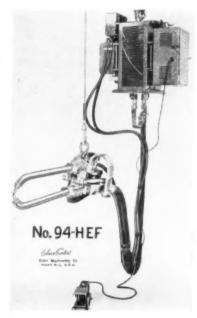
CERRO DE PASCO COPPER CORPORATION Dept. 7.

40 Wall Street

New York 5, N. Y

EISLER AIR OPERATED PORTABLE WELDER

A portable gun welder of the rocker type has been introduced by the Eisler Engineering Co. The unit is air-operated with a double acting air cylinder, which is placed inside the construction between the lever arms, transmitting the air pressure to the electrodes by lever action. This allows for free working space around the welding horns, facilitating welding in areas normally difficult to reach



The power unit consists of an air-cooled transformer, a pneumatically (or electronically) actuated timer, and a high speed contactor for timing the weld speed and stroke repetition. The welding cycle itself is actuated by a foot switch or push button.

The transformer and head are connected by a water-cooled low-impedance cable, suspended overhead. The horns can be exchanged to fit depths of from 8" to 24". The water-cooled tips are of special high conductive and wear resist-

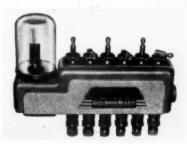
ing alloy. The welder is rated from 30 to 75 KVA. Additional information will be supplied by the Eisler Engineering Co., Inc., 743 So. 13th St., Dept. 71, Newark 3, N. J.

GITS MUPLTIPLE OILER WITH CONSTANT LEVEL SYSTEM

Gits Bros. Manufacturing Co., makers of oiling systems and lubricating devices, has announced a new multiple oiler, designed to meet the demand for a central point of oiling of multiple remote bearings. It is a centralized unit made up of a transparent reservoir of unbreakable plastic with a non-spill valve which simplifies refilling, and a main reservoir from which copper tubes lead to the various remote oiling points. In the main reservoir, fed from the plastic constant level reservoir, the oil is maintained at an even level, insuring a regulated flow of oil to the individual bearing. By the same principle, overflow and flooding of bearings is impossible.

Featured is the series of valves, one for each lead, permitting the flow to each bearing to be adjusted individually, or turned completely on or off. The system may serve more than one machine, or it may serve units with independently working parts.

Shortage of skilled personnel has made the supervision of machine care difficult; plant owners entering the post war era with worn machinery face delays on re-



pairs and replacements. As a result, they have come to rely to a great extent on mechanical oiling systems which require less care and are economical in maintenance. Complete information supplied by the Gits Bros. Mfg. Co., 1846 S. Kilbourn Ave., Chicago, Ill.



v BREAK 'em

HOW MUCH DOES IT COST YOU TO REPLACE BROKEN DRILLS, TAPS, REAMERS, ETC.?

Added to losses due to work spoilage, labor of extracting broken pieces and production line tie-ups, it can be a formidable total.

You can cut these mounting losses easily by the use of BUFFALO TORQUE CONTROL COUPLINGS. Adjusted at a fixed torque to perform a particular operation, these couplings automatically throw out when overloaded, thereby releasing the driving power thru the couplings themselves, but automatically re-engaging and re-assuming the driving power when the over-load has been removed.

Available in production and utility models, in sizes for all operations on drilling machines, lathes, turret lathes, bring mills, etc. Also manufactured as stud drivers, nut setters and transmission types.



Machine Tool Type Production Model

Descriptive Bulletin No. 1010 sent on request

BUFFALO MACHINERY CO., INC. 838 Grant Street Buffalo 13, New York

CORRECT EXTREME MISALIGNMENT AT LOW COST



ONE PIECE RUBBER FLEXIBLE COUPLING

DAMPENS NOISE AND VIBRATION
—CUSHIONS STARTING TORQUE



←RUBBER FROM END TO END → NEOPRENE REINFORCED WITH NYLON

FLOATING BUSHINGS

Machined brass bushings are not integral with ferrule—To allow floating action—No die castings.

Lengths-11/2" to 10"

Bores-16", 3%", 16", 1/2", 5%", 3/4", 1"

Flexible Coupling Mfg. Co. 6220 South Ellis Ave. Chicago 37, III. Phone DOR. 2350

ACROHEX CONCAVED FACE CABLE

New developments in insulated cable manufacture necessitate new methods of cable marking. To meet the requirement of one cable manufacturer, Acromark engineers developed the new concaved style Acrohex Electric Brander.

This accessory may be plugged into any standard a-c 110-220V outlet and in approximately one minute, has reached sufficient heat to brand most of the cable insulation materials with code marking or other required information.

This unit is not intended to supplant the Acromark Insulated Wire Marking Machine but to supplement it by marking (on the job—in the plant or in the field) those supplemental code markings, designations or installation markings that facilitate the installation or use of the cable.



The code marking die is deeply engraved for clear marking, and the characters are concaved to fit the contour of the cable in a wide range of sizes. An adjustable "V" clip is held at each end of the branding die to serve as a gauge in putting the mark on accurately and quickly.

Color branding may be accomplished with this unit by laying a piece of transfer tape on the cable then applying the brander against it.

For marking plastic, enamel, wax coating, fibre or fabric coatings or insulations

of wires, cables, cords, etc., this units is widely adaptable and immediately available.

For further information, write to The Acromark Co., 15 Morrell St., Elizabeth

duty rubber appliance cord, and unbreakable flat plug, rubber mounting feet. The unit is completely metal-enclosed: all components are underwriters

OUTLET BOX PROVIDES 8 RECEPTACLES

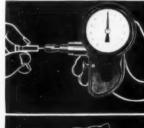
Allied Laboratory's new Multi-Plug Outlet Box, Model 3001-A, solves the problem of insufficient wall outlets. The unit contains eight standard receptacles, and can be plugged into any wall outlet, a-c or d-c, 110-125 volts.

The Multi-Plug is useful both where a temporary electrical circuit is needed, viz, temporary lighting fixtures, and where a permanent circuit is needed to enable a large number of instruments or machines to operate from a small number of wall outlets.

The boxes can be pyramided; one can be plugged into another. Two fuses protect the main line against shorts and overloads. Other features include a neon pilot light (1/25 watt), which tells a-c from d-c, and signals voltage on all plugs; a long stroke toggle switch which breaks both legs of the line; the box comes complete with 15 amp. fuses, 12 feet of heavy



approved. Cabinet dimensions are 3" x 4" x 5". For further information write Allied Laboratory Instrument, Inc., 355 W. 26th St. New York 1. N. Y.





"COMTORPLUG"

For gaging PRECISION HOLES

1/8" to 8" dia., to Fractions of .0001"

Comtorplug patented expanding internal comparator is rugged enough for use by machine operators, and bench inspectors, highly accurate for use by final inspectors. Exclusive features of selfalignment assure positive accuracy and uniform results by different

users. Gives a fixed—not passing —reading to within .0001". Shows actual size of hole, detects front or back taper, out-of-round, bell mouth, etc. Exactly right for Quality Control programs.



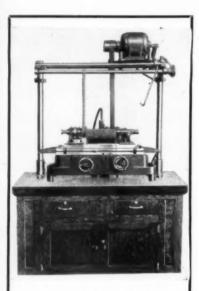
Request 8-Page Bulletin 33

COMTOR CO.

62 RUMFORD AVENUE

"COMTORGAGE", Precision External Comparator: Bulletin 30
COMTOR SURFACE SMOOTHNESS COMPARATOR: Bulletin 32

WALTHAM, MASS.



INVESTIGATE TODAY

Six Models Cylindrical Bench Grinders; Plain, Universal and Semi-Universal. 5" Swing; 9½" between centers to 10" Swing; 16" between centers.

Prices range from \$640.00 to \$1895.00 Motors and Attachments extra.

Write for catalog on Super-Precision Grinders

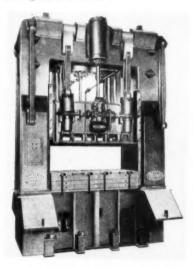
CRYSTAL LAKE GRINDERS
CRYSTAL LAKE ILLINOIS

Since 1910

NEW TRIPLE ACTION DRAWING PRESS

E. W. Bliss Co., Detroit, announces a new toggle press line, unique in the arrangement of the driving mechanism, for triple action drawing of large automobile stampings in a wide range of capacities and widths. These presses have four point suspension on both the upper slides which are accurately timed and mechanically locked with a crank driven plunger in the bed.

The location of the driving mechanism below the bed reduces the machine's height above the floor, providing a greatly lowered center of gravity. Greater stability is accomplished with increased footing front to back.



With triple geared driving mechanism, which consists essentially of motor, drive shaft, and intermediate gearing, the lower plunger is driven by two main crankshafts supported by individual crowns beneath the press bed. The main gears, mounted on the outer ends of the crankshafts, have hubs on each side which are the eccentrics, driving the upper plunger and blankholder mechanisms. Each corner of the blankholder can be power adjusted either independently or can be synchronized with the other three corners.

The entire frame is of welded steel. The upper slides are counterbalanced and the

lower slide is counterbalanced on all larger machines. The illustrated machine is driven by a 75 hp Reliance motor directly connected through the gearing. The total height is 367 inches, of which, 210 inches is above the floor line.

Dimensions of the illustrated press are: Blankholder Stroke: 22"; Upper Plunger Stroke, 34"; Lower Slide Stroke, 22½". The Capacity in Tons at the bottom stroke: Blankholder, 275; Upper Plunger, 400, and Lower Slide, 350.

Additional information will be supplied by the E. W. Bliss Co., 451 Amsterdam Ave., Detroit 2, Mich.

PARKER 10-GAUGE SQUARING SHEARS

A new 10-gauge power Squaring Shear is now in production at the Santa Monica, Calif. plant of the Parker Manufacturing Co. Parker Shears are built from extra-heavy all steel welded plate. The parts are normalized after welding to relieve stresses. The bed, ram, hold down, and working parts are powerfully reinforced. The breaking point of the component steel is three times that of cast iron, giving Parker Shears a strength equal to larger and heavier machines.

Of compact, box type design, with a low center of gravity for minimum vibration, Parker Shears stand only 47" high, and weigh 4250 lbs. The unit is supplied with a 5 hp motor, allows 85 strokes per minute, has a cutting length of 73", a blade length of 75"; it occupies a floor space 32" x 104".



Oil hardened tool steel 4-edged blades cut accurately, last longer between grinds, and are standard equipment. Drawn or folded parts may be cut to within 1½" of their shoulder, allowing a close trim. Additional information and quotations will be supplied by the Parker Manufacturing Co., 2200 Colorado Ave., Santa Monica, Calif.

NEW! LOW COST, KNEE TYPE MILLING MACHINE ...

designed for small, accurate work

No. 000 Milling Mαchine Lo Tr Ve Flora All

GENERAL SPECIFICATIONS

Longitudinal Feed 6"
Traverse Feed 1½"
Vertical Feed 4"
Floor Space 21x14½"
Tapered Gibs

No. 5 B. & S. Spindle Taper

All rotating parts moving in anti-friction bearings.

All sliding members moving in scraped dovetailed ways.

Manufacturers of Precision Knee Type Milling Machines and Production Attachments

BURKE MACHINE TOOL CO. 510 Sandusky Street CONNEAUT. OHIO

Write for Literature . . . TODAY!

SPECIAL BEHR BORING BAR

- . FXTRA SOLID
- . EXTREMELY ACCURATE
- . CHATTER PROOF
- . TAKES BIGGER CUTS
- BETTER FINISHES



This SPECIAL BEHR BAR is designed to bore and counterbore four different parts on a large turnet lathe.

STANDARD BEHR BARS are available in shanks to fit your machine. New accessories will bore to 23" diameter.

WRITE FOR FREE FOLDER

BEHR PRODUCTS
COMPANY
13732 Woodward Ave.
DETROIT 3, MICHIGAN

PORTABLE ELEVATING TABLE WILL CARRY 2000 POUNDS

The Industrial Elevating Table, a product of Montgomery & Co., New York machinery dealers, is a rugged, steel constructed unit, designed to carry and lift loads up to one ton. Its minimum height from the table top to the floor is 26", and it may be raised to 43", by means of the revolving hand wheel. It remains safely locked at whatever height is desired. The table top itself is 20" x 32"; overall width of the unit is 26".



This portable table is a useful accessory in tool rooms and machine shops, according to the manufacturer, since with the use of the table, one man can easily perform operations such as moving heavy dies from shelves to punch presses, transferring work from mills to drill presses, supporting and levelling overhanging pieces on drill presses, etc. For further information write Montgomery & Co., Inc., 53 Park Place, New York 7, N. Y.

HIGH SPEED BIT AND CUTTER GRINDER

This new accessory permits accurate and rapid resharpening of router bits and small diameter shaper cutters and knives. Tool rest tables facilitate holding cutters properly to the grinding wheels. A tool holder for straight flute router bits is included. The grinder motor provides a direct drive of 8500 rpm for cutters and

shaper knives; the belt drive to the upper spindle attains 30,000 rpm for router bits.

The grinder is lightweight, portable, and can be set up on any work bench. Complete accessories such as grinding wheels are available; as optional equipment, a tool holder for spiral router bits can be provided, allowing correct bits.



lead when the holder shaft is rotated. Information upon request; write for Bulletin 1119, to the Onsrud Machine Works, Inc., 3910 W. Palmer Ave., Chicago 47, Ill.

ARBORS PERMIT MACHINING TO DESIRED SIZE

The Pentwater Machinery Co. has announced the development of an expansion arbor for holding work pieces in a lathe during turning, facing, and similar operations. This accessory can be held in the collet, lathe chuck, weldon holder, or between centers. It is manufactured of tool steel, left soft to allow easy machining to any desired size or shape.



The arbors are supplied in 13 standard diameters of from ½" to 2", in gradations of ½"; the standard length is 5"; O.D. is ground to within .001". Other diameters and lengths can be furnished on special order. For additional information and quotations, write to the Pentwater Machinery Co., Dept. BB, Pentwater, Mich.

THE NEW AIR-OPERATED

ALLEN DIAL FEED TABLE

For Use with PUNCH PRESS, DRILL PRESS, PRODUCTION MILLER, SPOT WELDER, ETC. Recommended for assembling, punching, machining of nuts, stampings, etc.

MODEL A—A 3-way valve, actuated by some motion from the machine to which the table is to be synchronized, allows compressed air to move a hardened and lapped piston to operate the Pavl arm. The Pavl indexes the plate and LOCKS in the indexed position until the valve is released allowing a spring to return the Pavl, ready for the next indexing.

MODEL B—This model is an adaptation of Model A wherein a special control valve is incorporated so that the plate is automatically self-indexing. By merely turning a serew, speed is adjustable from one indexing each half second to one each ten seconds. The table is locked in position netween indexings. Recommended for soldering, assembly, etc., operations where no mechanical motion is available.

*F.O.B. Brooklyn, New York

s 125.00





Dia. of Index Plate—71/4" Height from base to top of Index Plate—2-15/16". Standard 12-position Index Plate. All working parts hardened.

Write for Literature Inquiries invited from Air Equipment Dealers

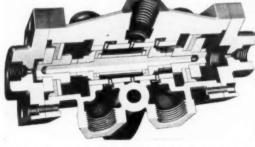
Y 30

3011 FT. HAMILTON PARKWAY BROOKLYN 18, N. Y.

A. K. ALLEN COMPANY

LOGAN VALVE LINE INCLUDES 79 STANDARD MODELS

An improved line of air control valves in 79 standard models is announced by the Logansport Machine Co., Inc., manufac-turers of air and hy-draulic equipment. Built with sliding piston - type construction, which eliminates valve seats and rod packing with their accompanying wear and maintenance, these new Logan 4-way air valves have a wide use in manufacturing and processing operations, and are offered in a wide variety of models



The Direct Operated types include five classes: the Manual, Toggle, Cam, Foot, and Light Duty. The Manual type con-



sists of 2 and 3-position types, with ball detent or spring return to top, bottom, or neutral; 3-position valves have cylinder ports exhausting or blocked in neutral. The Toggle type allows for trip dog, cam, or manual operation. The Light Duty type is a highly compact unit, with ½" port 4-way valves operated by finger type or palm-type push button; they include toggle, cam, or built-in air cylinder operation.

Three models are designated as Remote Operated types: the Electric (Direct), in which the valve piston is lever-connected to integral solenoids, which may include either a single solenoid with spring return, or double solenoid types; all are activated by remote limit switches or push buttons; the Bleeder type, which is activated by remote 2-way bleeder valves operated by hand, toggle, foot, cam, electric solenoid, or built-in air cylinder; the Pilot Pressure type, available in 2 and 3-position types, the latter with ports exhausting or block in neutral and returning to neutral by spring or line

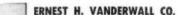
*** EVCO REVOLVING TIP LATHE CENTER ***

- Lowest Priced
 "Live" Center
 On The Market
- Rrins ceel and yields under load to compensate for work expansion
 Same dimensions as
- Same dimensions as standard solid centers
- No more messy lubrication of work centers
- Ne more damaged center holes in work
- Accurate quality construction throughout
- Saves time—saves money—saves work

\$6.25

No. 2 Merse Taper Shank No. 3—\$7.75 No. 4—\$9.75 Merse Taper

ASK YOUR DEALER FOR DETAILS



448 Golden Gate Ave. San Francisco 2, California



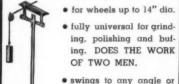
pressure. This model is activated by 4-way or 3-way pilot operating valves manipulated similar to the Bleeder type.

There is also the Balanced Piston-Type Design, assuring effortless operation, since Logan valves do not operate against air-pressure; the balanced construction produces equal pressure on both sides of the piston. Pistons are light weight, permitting high speed operation and rapid reversals, especially in the electric type models; rapid response also results from the full pipe size or ports and internal air passages, permitting unrestricted air flow.

A new 48-page catalog which includes a mechanical drawing and dimension table for each valve type, together with pertinent data, is available. Address the Logansport Machine Co., Inc., 905 Center Ave., Logansport, Ind.

Since most operators do not have the skill required for good hand pointing, the use of standard drill pointing machines such as the Sellers and the Oliver, is highly recommended.

JEFFERSON SWING FRAME GRINDING AND POLISHING MACHINE





DEALERS AND AGENTS WANTED
WRITE TODAY for folder of grinders and
other machines,

JEFFERSON MACHINE TOOL CO. 700 W. 4th. Cincinnati 3, 0.

WHITNEY- JENSEN PRODUCTS

36" FOOT SHEAR



WHITNEY METAL TOOL COMPANY

SMALL END MILLS FOR TOUGH JOBS MICRO MINIATURES

High Speed—Fast Feed

A new precision method of manufacture gives MICRO MINIATURES outstanding QUALITY and unusual STRENGTH for production use. MICRO MINIATURES will help you. They have eliminated milling problems for others.



Call your dealer or write for descriptive catalog SPECIAL SIZES to fit your job

STOCK SIZES

\$\frac{1}{2}'' \cdot 2 \cdot \text{Flute}

\$\frac{1}{2}'' \cdot 2 \cdot \text{Flute}

\$\frac{1}{2}'' \cdot 2 \cdot 3 \cdot \text{Flute}

BALL ENDS

1.2 - 2 - Flute
1.2 - 3 Flute
1.4 - 2 - 3 Flute
1.5 - 2 - 3 Flute

SINGLE OF DOUBLE END All sizes & Shank

WOODSON TOOL CO., INC. 4811 1/2 W. Lennox Blvd., Inglewood Cal.

PRATT & WHITNEY ELECTROLIMIT GAGE FOR CHECKING CAM CONTOURS

To eliminate slow toolroom setups and provide a
fast and accurate means
of checking the cam contour of automotive pistons, Pratt & Whitney,
Division Niles - BementPond Co., West Hartford,
Conn., has developed an
Electrolimit Contour
Gage, 2-station gaging
fixture designed for
checking the cam contour
of centerless cam ground
pistons.

The gage consists of a floating pressure shoe arbor mounted on a slide, which may be pulled out to install the piston for gaging and to remove the piston after it is measured. The arbor assembly rotates through

an 180° arc. Two Electrolimit heads are used to indicate the cam contour. Each head has a floating gaging point and a fixed pickup point.

When the piston is mounted on the



floating pressure shoe arbor through the piston pin hole with the piston skirt up, the arbor is pushed into position for gaging and locked. The fixed pickup points contact the bottom piston ring land

Monarch Precision SHAPLANE Radius Tool



Patent Pending

For Lathes, Shapers, Planers, Boring Mills, etc. Min. Rad. 1/2" to Max. Rad. 21/2".

C. B. TEETER Machine Specialties

4470 Oakenwald Ave., Chicago 15, III.
Phone Drexel 3571



rately. Stocked in 60, 72, 82, 90, 100, 120 degree included angle, 1/4", 3/4", 5/4", 5/4", 5/4", 5/4" diameter, with 1/4" shank and 3/4", and 1" diawith 1/2" shank. Available from your Mill Supply dealer or direct.

AERO TOOL COMPANY
229 WEST OLIVE - BURBANK, CAUF.



connected Stop Imited epith of Co-sinks and Co-bos Imited epith of Co-bos I

AERO TOOL COMPANY
229 WEST OLIVE - BURBANK, CALIFORNIA

which has been ground to a true circle. The floating gaging points rest on the bottom of the cylinder skirt. As the piston is rotated through 90° either side of center, the meters indicate the variation in cam contour between the ring land and the skirt.

When variations have been observed, the slide is returned to center position, unlocked, pulled out and the piston removed, ready for the next.

BEHR HEAVY-DUTY ACCESSORIES

A line of heavy-duty accessories is announced by the Behr Products Co., designing and manufacturing engineers. These tools are used in Behr Bars for facing, boring etc. up to 23" diameter; they supplement the present H.S.S. or T.C. tipped shoulder boring blades for diameters up to 12½", thus increasing the range. The new large hole adaptor with a split sleeve, holding a ¾", ½", or 5½" tool bit in any bar A1500, will work diameters from 3¼" to". To". The extra large adaptor will increase the range to 10½" diameter when used in a Model A1501 Behr Bar.

The tool holder illustrated in Model 1501 Bar (3½" Head Dia.) is made to hold 36" or ½" tool bits.

All blades, adaptors, etc., are interchangeable between any model A1500 or A1501 Behr Boring Bar, yet may be locked for continual production repetition. A new catalog No. 101A is now



available, indicating complete specifications, by writing to the Behr Products Co., 13732 Woodward Ave., Detroit 3, Mich.





Veed a
"TELESCOPIC SIGHT"
for Machine Work?

GET AN

OPTI-SETTER

THE ALL-PURPOSE SET-UP AID

- Centers Drill Bushing to Layout.
- Specialized Production Alignments.
- Clamps to Height Gage for Inspection.

White to Gage for Inspection THE BENTON CO.

DEPT. H. 351 S. LA BREA, LOS ANGELES, CALIF.



GEARS

TO YOUR

SPECIFICATIONS

- Furnish Complete or Cut Only, Any Material.
- Spur and Helical Gears to 12"
 Diameter, 6 Diametral Pitch.
- Straight Bevel Gears to 3" Diameter, 12 Diametral Pitch.
- Worm Wheels, Worms, Sprockets, Splines, Serrations, Irregular Forms, Ratchets.

MICRO PRECISION GEAR & MACHINE CO.

1736 East 30th St., Cleveland 14, Ohio

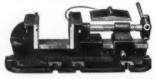
D. C. MOTORS

Good delivery on 1/4, 1/3 & 1/2 H.P. direct current motors. Mirs. of A.C. generators 500 watts to 125 K.W. Bolary converters. frequency changers, light plants.

KATOLIGHT

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GEM VISES



J. E. MARTIN MACHINE WORKS SPRINGFIELD, OHIO

* THE * WONDER CUTTER

The lowest. priced wire and rod cutter on the market. The hardened ters last indefinitely.

Hand operated. A giant for work, cuts wire and rods up to %-in, round or 3/6-in. square and band iron up to 1/8 in. by 2-in. Adjustable stop for repeated cuts to same length. Large or small, your shop can use a WONDER CUTTER.

Write today for prices.

THE FEDERAL FOUNDRY SUPPLY CO.

Cleveland, Ohio 4602 East 71st St.,

SHEFFIELD SELECTOR SEGREGATES PARTS INTO 4 CLASSIFICATIONS

An automatic hopper-fed roll selector for the inspection of length and diameter of small precision parts has been developed by the Sheffield Corp., of Dayton. Ohio. It can be adjusted to permit an indefinite number of parts of various sizes within the capacity of the machine to be gaged quickly, economically, and with extreme precision, to a tolerance of

The flexibility permitting such a quantity of different size parts to be gaged is accounted for by its range of adjustment, 7/32" to 31/32" on diameters and from 9/32" to 3" on lengths, Only a brief time is required to change from one setup to another.

After setting up the automatic roll selector, using minimum and maximum masters or two parts known to be the correct size, the parts are placed in a hopper. The hopper or feed rails which touch the parts are made of proper material to prevent the parts from congesting due to residual magnetism. A reciprocating device picks up the units,



which proceed by a gravity slide to the gaging position. One Electrichek gaging head checks the overall length while two other gaging heads check the diameters at each end. During the gaging operation each part is classified and segregated into

- CLOSED Plain Type



CLOSED MARK

Offset Type

ONTINUOUS HIN

All hinges shown can be furnished with special holes, cutouts and hends to blue-print in metals to suit the job.

THREE-FOURTHS OFFSET

AUTO MOULDING & MFG. CO.

1110 E. 87TH ST. CHICAGO 19, ILL.

SPECIFICATIONS: Open Width % to 6' Gage Material .040 to .125 Pin Diameter .101 to % Lengths to 120"

one of four classifications-parts within tolerance limits, diameter within tolerance limits and length oversize, oversize on diameter, and undersize on either or both diameter and length. Chutes are used to pass the segregated parts into separate bins.

The automatic roll selector illustrated operates at a fixed speed to check and segregate 3600 parts an hour into the four classifications while gaging the three dimensions simultaneously.

ARRASIVE STICKS SHAPED TO FIT JOR

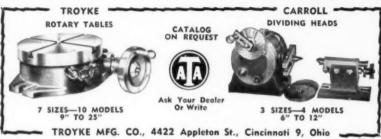
The Sandusky Abrasive Wheel Co., manufacturers of grinding and polishing wheels, announces the Sandusky Flexible Abrasive Sticks; these accessories are made of graded and selected abrasive grains bonded in rubber. They are designed to be used for light grinding, cleaning, burring, sharpening, and polishing.

A feature, it is claimed, is the ease with which they can be cut and chaped for jobs such as finishing contours. grooves, and difficult-to-reach places. By shaping them to fit the work, the largest possible grain area reaches the work piece, accomplishing a better job of finishing. The sticks may be cut with a

knife, file, grinding wheel, or hacksaw, enabling them to be altered to special shapes. They can be fastened in the tool post of a lathe for rapid finishing operations

Sandusky Abrasive Sticks are available in 3", 6", and 8", lengths, fine, medium, and coarse grains. Standard shapes inand coarse grains. Standard snapes in-clude rectangular, square, triangular, and round, with sizes ranging from ¼" dia. round to 8" x 1" x ½" in the rectangular sticks. Complete information from San-dusky Abrasive Wheel Co., 695 W. Ransom St., Kalamazoo, Mich.





I-T-E Circuit Breaker Co. Reveals 57% Reduction In Slotting Time!

Nelco Carboloy-Tipped Tools Cut 100 Slots IN 1.4 HOURS

Instead of former 3.2 hrs. with usual steel cutters



Photo Courtesy of 1-T-E Circuit Breaker Co.

In Gangs of 2 (Sometimes 3) Nelco Carboloy-Tipped Cutters Set New Records

-Compare This Record-

Job. Cut slot ½" deep, 5" long, .252 wide. Material: Hard extruded copper terminal block Machine: Kearny & Trecker, 20 CSM Milling Machine, Horiz. Type, Spindle RPM of 1250

With Usual-Type Steel Cutters

3.2 hours to cut 100 slots. Table feed of 5\%" per min.

Did not hold size due to high amount of wear caused by hard copper.

With NELCO Carboloy-Tipped Cutters

1.4 hours to cut 100 slots. Table feed of 90" per min.

3200 slots obtained before dulling or loss of size occurs.

All Nelco Tools are designed and made to make production faster, better. Write for the new Nelco catalog and for distributor nearest you.

NELC®

For That EXTRA EDGE in Production 370 Hamilton Avenue, Dept. 3. Brooklyn 31, N. Y.

SCRAP CUTTER ADJUSTABLE TO

A ram-driven scrap cutter which can be used on most punch presses is announced by Haller Machine & Mfg. Co., Inc. This unit will cut all stock to 4" width and 3/32" thickness, and through greater ease of scrap handling and increased value of the cut scrap, is extremely economical, according to the manufacturer.



Designated as Model D-611 Scrap Cutter, the unit measures 6½" x 9½" deep x 10" high. It is mounted on the bolster plate of the press and is driven directly from the ram or die; the accessory is adjustable for any length of ram stroke up to 6". The high speed steel blades can be removed for resharpening and are replaceable.

Full details are given in an illustrated bulletin available upon request to Haller Machine & Mfg. Co., Inc., 7940 Tireman Ave., Dept. BB. Detroit 4, Mich.

NEW MILLING CUTTERS FEATURE TRIANGULAR BLADE

For high production of malleable or alloyed castings, such as cylinder blocks, heads, motor frames, pump castings, and the like, Weddell Tools, Inc.. 37 Centennial St., Rochester 11, N. Y. have developed the Super Tri-Bit Face Mill with closely spaced cutter blades.

Tri-Bits in Super Tri-Bit face Mills fit into triangular shaped holes. The cutter

body is tied together all around the blade on the outside diameter of the forged and heat treated alloy steel body. There are no open slots to spring or tear open. The blades are locked home into a vee by a single lock screw. No hammers drift, or wedges are required. The blades



are positively backed up by a simple adjusting screw permitting minute blade adjustment.

Super Mills are furnished with cutter

blades of any cutting material, set at effective cutting angles; chip flow is directed away from the work. Roughing cutters are %", while finishers use %". Same blade may be used for right or left hand cutters. Super Tri-Bit Face Mills are only recommended where the rigidity of the work, and the power available are adequate to match the characteristics of the cutter.

HEIM ROLLER BEARING PILLOW BLOCK

The Heim Co., of Fairfield, Conn., has announced the production of a new Roller Bearing Pillow Block. According to the manufacturer, this accessory provides a low cost, efficient means of supporting revolving shafts. It consists of the application of a sturdy base and metal strap to the Heim flanged type roller bearing to comprise a simple pillow block.

The stock sizes include shaft diameters up to one inch. The rollers are maintained free of dust by the nature of their construction, consisting of the outer casing and the inner roller race; this feature also retains the lubrication. The pillow block may be mounted upright, vertically, horizontally, or on the diagonal. A bulletin is available containing complete data by writing to the Heim Co., Fairfield, Conn.



E VERYONE in your plant who does precision work can do it easier, faster, safer, better by wearing a Magni-Focuser. This binocular eye-loop enables you to see an object sharply magnified with the comfort and clarity of normal vision. Relieves eye-strain—lessens fatigue—reduces accidents. Allows free use of both hands. Available in different magnifications, from 2% at \$8.50 to 3% at \$10.50. If your distributor cannot supply you, order direct, Money refunded if Magni-Focuser does not help you see better.

EDROY PRODUCTS CO. 478 Lexington Ave., New York 17, N. Y.





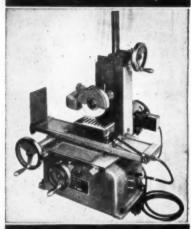
are used as integral parts of Stokers, Paper Box Machinery, Elevating and Hoisting Apparatus and many other applications where speed must be reduced.

Descriptive literature covering the many sizes and ratios gladly sent on request.

CHARLES BOND COMPANY

617-623 Arch Street, Philadelphia 6, Pa.

SANFORD



High-Speed BENCH SURFACE GRINDER

ACCURATE WITHIN .0001

A sensitive machine built to rigid standards of accuracy and workmanship specially designed "For the job that fits in your palm."

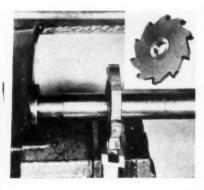
WRITE FOR BULLETIN

SANFORD MFG. CO. 1020-28 Commerce Ave. Union, N. J.

NEW SUPER CUTTER FOR

The new Bi-Axial carbide tipped milling cutter, developed by Super Tool Co., 21650 Hoover Road, Detroit 13, Mich., for slotting steel, is performing on jobs that have been found too difficult for ordinary tungsten carbide slotting cutters.

Cutter includes two axial rake angles and negative rake on the blade, which account for automatic centering and absence of flutter. This eliminates side wear and makes possible holding of close tolerances as well as increasing the number of cuts per grind. The new Super Tool Co.



Catalog No. 47 illustrates the Bi-Axial Cutter and specifies standard sizes in which it is now being stocked.



Lifetime conical bearings, stainless and nonmagnetic. Sturdy construction, no returning for adjustment or service. .014" reading. Price 56.50. Write for folder.

J. R. Reich Manufacturing Co. 45 E. Stroop Rd., Dayton 9, Ohio

TRANSPARENT PLASTIC BOWL AIR FILTER

The C. A. Norgren Co., has perfected a new type air filter, designed and engineered to eliminate oil emulsion, moisture, and solid impurities from compressed air lines. Centrifugal force is utilized to separate moisture from the air. A double right angle air inlet imparts a swirling motion to the air as it enters the filter bowl, throwing the moisture against the bowl wall where it collects and runs down into the quiet zone below the baffle plate.

A thin plastic baffle, with holes on its periphery, divides the filter bowl into two zones, an active zone where separation takes place, and a quiet zone where the moisture accumulates instead of being driven along with the air.

Through the transparent bowl the operator may see moisture being separated, and knows at all times whether or not accumulated impurities in the quiet zone should be drained off through the bottom cock.



Centered in the bowl and directly above the baffle plate is a 200 mesh, Monel wire screen which separates all solid impurities from the air as it leaves the filter.

The Norgren Transparent Plastic Bowl Air Filter comes in 3 sizes—1/4", 3/8" and 1/2" I.P. Descriptive literature available from C. A. Norgren Co., 222 Santa Fe Drive. Denver 9. Colo.

CENTER Specialists since 1908



Preloaded Precision Ball Bearings. Replace-High Speed Points. Smooth, sustained high accuracy for all average service require-

BALL & ROLLER
BEARING TYPE
Preloaded Precision Ball

Bearings in head. Precision Roller Bearings in shank. Replaceable High Speed Points. For sustained accuracy at high speeds and heavy feeds with carbide tools.

OUTSIDE of SPINDLE

Preloaded Precision Ball Bearings. Specified for heaviest duty and loads on large workpieces in railroadshops, etc.



Cesigned and built by CENTER SPECIALISTS who believe that a good center requires as competent engineering as the precision machine tools it will be used in. Write for Catalog No. A-46

THE READY TOOL CO.

550 IRANISTAN AVE BRIDGEPORT 5, CONN.

OTHER RED-E PRODUCTS YOU SHOULD KNOW...
CEMENTE CAMBER TIPMED
ANTE A SCHOOL CHAPTER
WILL US SEEN STATE (TO THE TELL SCHOOL CHAPTE TO THE
HIGH STATE STEEL CHAPTER
RED-E WEN SEPARTURE
RED-E WEN SEPARTURE
SALL STATEM CHAPTER

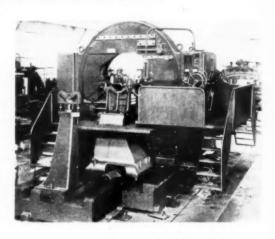
Bulletins on any or all of these Products on request.

CRANKPIN MACHINES STRESS ACCURACY

Wickes Brothers, manufacturers of heavy duty machinery. announce that they have begun the production of five models Turning Crankpin Machines for the machining of large Diesel crankshafts and intermediate main line bearings. According to the manufac-turer, these units will completely cheek. furn and fillet crankpins or bearings from rough forgings to finish sizes of .001" accuracy.

Wickes Crankpin
Turning Machines are
particularly useful when
the crankshafts are very
large, making it impractical to machine them in
higher production crankshaft lathes, or when
grinding equipment is
not available for finishing operations.

In machining crankshafts, the Wickes machine has the advantage of rapid set-



up, since the length of the crankshafts is supported on the main-bearing journals



Universal Stock Reel

The Humm Universal Stock Reel is an essential device for the handling and feeding of coil stock to Power Fresses.

- 1. Adjustable Reel to fit various sizes of coil.
- Reel is adjustable to suit height of Press.
- 3. Reel can be inclined to any position.
 PRICE \$55.00 F. O. B. BROOKLYN, N. Y.
 Manufactured By

John Humm Safety Equipment Co. 253 SHEFFIELD AVENUE BROOKLYN 7, N. Y.

LUMA Soldering Tool



RESISTANCE TYPE

A proven tool for all soldering jobs large or small. Heats instantly—low maintenance. Safe to operate. Write for details.

LUMA ELECTRIC EQUIPMENT CO.

on stanchions, close to the cutting tool. Since the tool rotates around the shaft, the crankpin does not vibrate and deflect. thus eliminating chatter. Unlike the conventional arrangement, the crankpin can be finish machined and polished without change of set-up

The Wickes machine is designed for higher cutting speeds and heavier cuts. enabling the metal to be machined faster; two separately mounted cutting tools increase the unit's efficiency.

The accuracy of the main bearing assembly is essential to accurate machining of the crankpin. The throw of the crank is established by moving the main bearing established by moving the main bearing ing assembly crosswise on the carriage which rides on the lathe bed, this entails a close fitting job, requiring close precision of machine parts. The carriage is accurately fitted to the main bed, which insures accuracy of the diameter of the pin along its length. The pin is machined by moving the carriage on the bed by means of a longitudinal feed.

For further details and specifications, write Wickes Brothers, 500 No. Tilden St., Saginaw, Mich, asking for Bulletin No. IH-625

STANDARD NUMBERING SYSTEM

A standardized numbering system for ball and roller bearing dimensions was presented recently to the American Standards Association by the Anti-Friction Bearing Manufacturers Association.

The new code, presented by H. O. Smith, executive secretary of the Association, calls for a common means of identifying types, sizes, tolerances, modifica-tion of internal design and lubrication of standard ball and roller bearings to meet all the requirements of users. This new identification system, he pointed out, uti-lizes a combination of figures and letters alternately, is flexible enough to take care of future changes in design, tolerances, lubricants and separator materials and is semi-descriptive rather than a dead code.

Mr. Smith pointed out that the industry's new numbering system permits the expression of more variable descriptions in terms of 4 digits, whereas the Army-Navy numbering system must resort to the use of 12 digits. In other words, the manufacturers of ball and roller bearings are able to convey all required information to bearing users in a much shorter and simpler form of standard identification.



Double Value in 2-in-PRODUCTIMETERS

NEW design of double deck Model "N" units offers smooth action and high speeds . . . both rows count simultaneously. Available in Stroke style, rear or end drive Rotary . . . and Predetermined Stroke and Rotary models.

Above model is Predetermined Stroke . . . top row is the Predetermined Unit for controlling pre-set quantity runs . . . lower row is totalizer for registering daily, weekly or monthly totals. Ideal for production control . . . accumulating totals for definite periods . . . computing total piece work earnings.

> Wide range of applications . . . Send for descriptive literature!

DURANT MFG. COMPANY

1928 N. Buffum St.

128 Orange St.

Milwaukee 1, PRODUCTIMETERS Providence 3, THE SPEEDOMETERS OF INDUSTRY



With AUTOMATIC
SAW SHARPENER
HACK SAWS
BAND SAWS
CIRCULAR SAWS

HOWE AND SON Inc.

Lassy TAPPER*

and Threader (Single Spindle)
SAVES TIME, TAPS, EXPENSIVE LABOR

"IT MEASURES AS IT TAPS"

Taps twice as many holes, quicker than with



a tap wrench. Always right angle holes. Tap capacity ½" thru 1".

DEPTH GAUGE. An exclusive patented Lassy feature. Always shows depth tap has traveled.

TAP ADAPTERS. No extra spindles needed. Change taps in a jiffy.

Write for Folder B2.

Immediate Delivery

LASSY TOOL COMPANY

PLAINVILLE, CONN.

*Patents Pending



At last, a dependable, low price coolant pump for machine tools. Constructed of non-corrosive materials. Plastic screen quickly removed for cleaning. Pully quaranteed by old, reliable manufacturer.

With this pump and small pan for fluid you obtain the same results as with expensive equipment.

May also be used for Evaporative Coolers, Fountains, Displays, etc.

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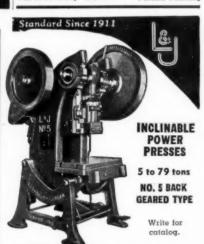
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AMERICAN METAL PRODUCTS CO.

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L & J PRESS CORP.

SUCCESSES IN Luchbough-Jordan Toni & Machine Co.
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THE NFW DEARRORN MODEL //E// CHUCKING

INDEXING FIXTURES AND



Dearborn fixtures meet every demand for automatic chucking and indexing, permitting several operations on the same piece

with only one setting.

Model E is both a degree and a ratchet indexing fixture. It may be changed from one to the other in less than a minute. It will index any number of degrees or any fraction of a degree. Two adjustable stops

are provided so that two angles can be obtained if

necessary.

Work is held by collets work is held by collets which take up to and including 1" round, 7%" hexagon and 34" square. Other and 3/4" square. Other shapes can be held with special collets.

Let us send bulletin giving full information.

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Help Increase Production use the This light, easily handled instrument when used by machine SWEDISH operators, or on final inspection, INTERNAL serves to increase production, INDICATOR GAGE

reduce scrap and assure a more uniform product. It is a reliable, precision indicator designed for rapid, convenient and accurate measurement of internal diameters. The scale range is: Plus or minus 0.001" graduated to 0.0001" and minus 0.020" graduated to 0.0001".

It can be set to any required size direct from Johansson Gage blocks or master ring.

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NIVERSAL HAND SPRING WINDER

Every shop and tool room needs it . . . a strong, dependable unit . . . quickly set up in any vise.

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SHARON PENNSYLVANIA

LAPPING and GRINDING COMPOUNDS

GRADE 17 (Medium) GRADE 18 (Medium Fine) GRADE 19 (Fine)

SPECIAL COMPOUNDS FOR BRASS AND BRONZE

PLUG COCK VALVES

These three grades of compounds have a special water soluble base that possesses excellent lubricating qualities for grinding various styles of plug and key cock valves. These compounds do not "niggard or score" while grinding—a common trouble with most compounds. They contain abrasives of the proper grit size for grinding or lapping-in brass and bronze plug valves. The finished parts can be washed with ordinary water.

Generous samples sent upon request



Photo courtesy Hays Mfg. Co.

UNITED STATES PRODUCTS CO.

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PITTSBURGH, PA.



HART MILLING FIXTURES

Hart Milling Fixtures firmly hold any shape stock—Round, Hexagonal, Octogonal, or Square for machining, automatically aligning the stock with the machine. Fixtures may be set up in horizontal or vertical position—grip the work on bottom as well as back; are easily kept clean. They have proved their efficiency in thousands of shops throughout the nation as well as abroad. Made in 4 sizes for stock from $\frac{1}{2}$ to 5 inches. May be ordered singly or in pairs.



HART ANGULAR VISE JAWS

Highly efficient on any machine table, the angular jaws firmly hold the work down. Quickly and easily installed by clamping or bolting into place. Jaws are hardened tool steel, 3"x6" with ½ inch thick serrated angle edges.

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HART 26 Mather Street MACHINE COMPANY

Dorchester - Boston

Massachusetts



room jobs with speed, accuracy, efficiency...
die work, jig and model making, drilling,
reaming, milling. Releases larger machines
for work better suited to their capacities. Easy
set-up, quick changeover...velvet-smooth
feed, eight spindle speeds from 275 to 4250
rpm...simple, direct micrometer setting.

FOR COMPLETE INFORMATION, WRITE FOR BULLETIN.

LINLEY BROTHERS CO., BRIDGEPORT 1, CONNECTICUT

LIGHT-WEIGHT, PORTABLE ARC WELDER

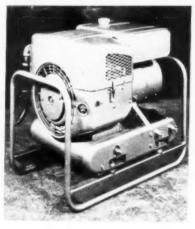
A new portable light weight, gas-driven d-c arc welder is in production by the Hollup Corp., division of the National Cylinder Gas Co. Two models are available: one is mounted on a two-wheel dolly with pneumatic tires; the other is a stationary type with a guard frame (illustrated).

The welder is 32" x 26", and stands 28" high, and weighs only 315 lbs. Light weight is achieved through use of an aluminum housing and aluminum alloys in engine parts wherever practical. The unit is easily transported cross-country for welding jobs in isolated areas not serviced by power lines, or hoisted to the top level of a building under construc-

tion for structural work.

The generator and engine are directly and solidly connected, forming a single unit. The generator is a 4-pole, self-excited type with interpoles. The welder is rated at 150 amperes at 30 volts on 50% duty cycle. It has a 4-cycle, two cylinder opposed design motor of the same type. The unit is supplied with an air-cooled, turbine type cooling fan: the opposed cylinder design simplifies distribution of the cooling air and results in smoother running balance and freedom from vibration

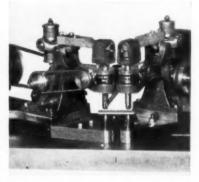
Electrodes up to and including 5/32". and certain types of 3/16" may be used. The manufacturer claims exceptional arc stability and economical operation. De-



scriptive literature is available by writing the National Cylinder Gas Co., 205 W. Wacker Drive, Chicago, Ill.

DUAL HEAD RIVETING HAMMER

The High Speed Hammer Co., Inc., riveting engineers, have developed a Riveting Hammer with twin heads which forms two rivet heads simultaneously.



The machine has a minimum center line distance of 23/4", and a maximum of 12".

SERVING INDUSTRY 62 YEARS URNINGS CRUSHER Advantages . .

1. Crushes

your curled turnings... thus reducing bulk volume by 80%

Enables MON extract cutting oil from turnings.

3. Permits fast and easier briquetting

4. Loads more weight per carload ...aise allows bet-ter control in furnace charge

> CRUSHERS FEEDERS



Cut-a-way view showing Hopper, Cutting Rotor, Tramp Metal Catcher Ideal for the regrinding of welding flux waste.

2915-17 North Market St., ST. LOUIS (6), MO.

Designated as No. 2AHD, this hammer has hydraulically operated clutch mechanisms. Capacity of this unit is ½" to 5/32" diameter rivets. Units for greater capacity are available.

Samples or blueprints of riveting work are invited for analysis from the manufacturers, the High Speed Hammer Co., Inc., 313 Norton St., Rochester 5, N. Y.

MARTIN TUNGSTEN CARBIDE TIPPED TURNING CHISEL

A turning chisel with a tungsten carbide tip is announced by Martin Inc. The variety of applications of this tool makes it useful not only in the machine shop, but effective in the home workshop as well. The chisel may be used in the hand turning of wood, and most non-ferrous metals, such as brass, aluminum, magnesium, copper, nickel, and zinc, and will also turn cold rolled steel.

The chisels come two to a set, either the ¼" round and ¼" square, or the small ½" round and ½" square. The Martin chisel may also be used to turn most types of plastic, such as Lucite and Plexiglas. The chisel will take any amount of turning work on such abrasive materials without

the ordinary wear and sharpening required on turning tools, according to the manufacturer. Further, turning may be accomplished without heavy compound tool rests. Additional information on



these accessories is available by writing to Martin Inc., 548 W. Rock Place, Dept. BB, Milwaukee 12, Wis.



SKILSAW INTRODUCES LINE OF

Skilsaw Inc., has announced a new line of 28 models of pneumatic tools, including pneumatic hammers, drills, screwdrivers, nut runners, and die grinders. The drills, screwdrivers, and runners are compact and light in weight; these features combined with their ease of operation and



balance make them useful for uninterrupted production line use. These tools are ruggedly built, precision engineered, and constructed with advanced design rotor, and heat treated alloy steel gears and shafts.

Speeds of from 800 to 2100 rpm are

available for the runners and drivers; a speed range of from 800 to 10,500 is available for the drills.

The grinders are available in three models, for die grinding, burring, rotary filing. Pneumatic hammers, in three sizes of four models each, are adaptable for riveting, light chipping, beading, star drilling etc. Further information on this new line may be obtained from Skilsaw, Inc., 5033 Elston Ave., Dept. BB, Chicago 30, 111.

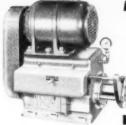
PROGRESSIVE PEDESTAL SPOT WELDER

A line of 30, 50, and 75 KVA pedestal type spot welding machines has been introduced by the Progressive Welder Co. By concentrating the strength in the frame at the front, where rigidity is needed, it has been possible to use a light sheet metal construction for the rear of the machine.

Removable panels and a full length door on the left side supply complete accessibility to all units contained in the machine, including transformer, heat controls, water piping, etc. The right side of the machine column is completely clear so that it can be used for side mounting of electronic or other welding controls.

The machines are designed to provide

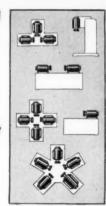




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Special Purpose Machine with this LEMAIRE VIN-RAM **Hydraulic Power Unit**

The panel at the right shows the many varied applications — for drilling, boring, reaming, etc. - vertically, horizontally or at any angle - in single or multiple arrangements. Send for complete cataloa.



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Designers and builders of unit and way type machines for single or multiple spindle drilling, baring, reaming, tapping, etc.—Twin Ram Hydraulic Units—Match-it Gear Chucks,



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"AUTOMARK" MACHINE



...For Assembly of Small Parts on production lines

... For Riveting and Staking Operations

... For Small Broaching Jobs

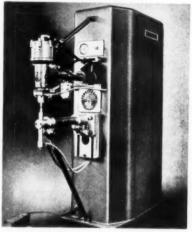
...For Marking Products and Various Parts Operates pneumotically from your shop

Operates pneumatically from your shop Air Line—with manual or automatic control — Regulated strokes, uniform pressure, s-p-e-e-d-y action, and easy and fast adaptability to all light marking and pressing jobs have made AUTOMARK an important production line machine.

Step up your Production Consult our Engineers

DEFIANCE MACHINE and TOOL CO., INC.

1920-24 S. Vandeventer, Dept. BB St. Louis 10, both adaptability for job welding runs and high output rates. To facilitate spot welding, knees are quick-adjustable, maximum stroke is high (2½"), and different types of interchangeable electrode holders are available. High productivity rates are insured by the speed of machine operation. The welding head is of low inertia, for fast action with this in view. Maintenance of constant performance is aided by the visible water circulation through 3 separate supply systems.



Welding arms are of large diameter, extending the frame rigidity to the electrode point. For deep throat machine support, arms bracing the welding arms are recommended to obtain maximum benefit from the rigid frame. Further facts will be provided by the Progressive Welder Co., 3050 E. Outer Drive, Detroit 12, Mich.

MOREY VERTICAL SHAPERS

for precision manufacturing 10"-14" stroke

Ask for illustrated circular

MOREY MACHINERY CO., Inc. 410 Broome St. New York 13, N. Y.

SLOW RAM ON ZAGAR 36" BROACHING MACHINE

Reduced set-up time is a feature of the new Zagar Do uble - Cylinder 36" - Stroke Hydraulic Broaching Machine. Two jobs may be set up at one time, and worked at either end, leaving the other set-up in readiness. Extremely slow ram speeds without loss of pulling power are made possible by an oil control valve. The return stroke is constantly fast. Pulling power of the unit equals 16,000 lbs. A hairline selection of speeds is permitted by controls grouped on the recessed instrument panel.

The new Zagar Broach-

The new Zagar Broaching Machine utilizes limited floor space. Double cylinders spread

the pulling stress and guarantee smoother operation. A Cuno oil filter eliminates valve-clogging. The machines are equipped with 220/440 volt, 3 phase, 60 cycle motor, wired to suit avail-



able current. For further details, write to Zagar Tool Co., Inc., 23880 Lakeland Blvd., Cleveland 17, Ohio, for Catalog No. MT-6.



QUEEN CITY GRINDERS COST LESS

- ·GIVE LONGER LIFE
- ·BETTER PERFORMANCE



It takes a top-quality grinder to stand up under the variety of work that pours through a shop day after day. Queen City Grinders are noted for their durability, freedom from downtime, and dependable performance. And they cost considerably less.

Illustrated is the I H.P. Heavy Duty Queen City Floor Grinder (No. 3F), equally adaptable to fine or heavy work. Has numerous safety and operating features. Send for catalog complete with prices and details.

Agents in Principal Cities

QUEEN CITY
MACHINE TOOL CO.
217 E. 2nd St., Cincinnati 2, Ohio

BARNABY TOOL HOLDERS FOR PRECISION ALIGNING

A line of all-steel precision floating holders is announced by Barnaby Manufacturing and Tool Co. These holders of conventional design, are now available in shank diameters of \%", \%", \%", \%" and \1\%".

Barnaby floating holders provide a means for aligning drills, reamers and similar tools with the work. The cutting tool is held in the head of the holder, either directly or by means of a bushing, and is clamped by a hardened steel set screw. One Barnaby hinged-shoe bushing blank is furnished with each floating holder.



An illustrated bulletin giving full details is available on request from Barnaby Manufacturing and Tool Co., 70 Knowlton St., Bridgeport 8, Conn.

DORMAN THREE-IN-ONE TAPPER

The Dorman Tapper, a three-in-one tool which can be used for both internal and external threading in steel (or any material capable of being tapped) up to % ", will take machine or hand taps, round split or button dies, or acorn dies. To thread, four screws are removed, the tap or die holder assembly is inserted, and the screws are replaced; the entire operation is a matter of minutes.



The assembly consists of a die holding clutch spindle, clutch bar, cover, and reverse gear. No. 1-RS assembly takes round split or button dies; No. 1-AC takes acorn dies, and No. 1-ST takes all stand-

ard taps. Parallelling these die holder assemblies and intended for use with the No. 2 Dorman Tapper are similar models, but with a capacity of $\frac{7}{8}$ ° in steel.



According to the manufacturers, the interchangeable assemblies on the tappers are economical and convenient; their construction assures long life and accurate performance. Further information will be supplied by the Dorman Machine Tool Works, 40 S. MacQuesten Parkway, Mount Vernon, N. Y.

ALL-PURPOSE, HEAVY-DUTY CLAMP

To meet the need of production and maintenance men for a heavy-duty, shock-proof clamp for attaching to the ends of cords on portable equipment, such as floodlights, sanding machines, floor polishers, drills, welders, etc., the Trico Fuse Manufacturing Co. has developed the new all-purpose Klip Test Clamp, designated as Model U-66.

The clamp supplies a vise-like grip on flat or round objects up to 1" diameter or width, such as fuse clips, meter or motor terminals, cables, battery posts, etc. A slight turn of the large finger-tip knob exerts a tremendous pressure. The clamp will carry up to 150 amps. continuously, and 200 amps. intermittently. A solderless lug accommodates No. 2 wire minimum, and No. 0 wire maximum; it swivels around the clamp, permitting the wire or the cable to hang in a natural position.



The No. U-66 clamp is a companion to the Trico line of heavy duty test clamps made by the Trico Fuse Manufacturing Co., 2948 N. 5th St., Dept. BB, Milwaukee 12, Wis.



Inclinable POWER PUNCH PRESS

Design:

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Well designed with metal added at points of greatest stress.

Tripping Device: Non-Repeat sliding key type, few wearing parts, simple adjustment, dependable performance quickly converted to continuous operations.

Spring Counterbalanced Reclining Device: Press can be inclined to 38° angle or returned to vertical position by simply loosening leg bolts and pushing press over or up to position required.

Quick Relinable Brake: Merely remove hand wheel, spread brake apart, remove worn linings and insert new. No Riveting.

Die Space:

Extra large die space and bolster area.

REESE-NIBLOCK, INC. WAKARUSA, INDIANA

TURE SUPPORT STAND

The Manderscheid Co. announces a new accessory for use with tube polishing ma-chines. Designated as Presto Tube Support Stands, these units enable more uniform polishing and more efficient handling of long tubing to be accomp-lished on semi-automatic tube polishers. according to the manufacturers.



The tubing rests on two rubber wheels located on top of the tube support stand. By adjusting the angle of the wheels, the movement of the tubing across the polish-

ing wheel or abrasive belt can be regulated to the desired speed. The stands hold tubing from ¾" to 5" in diameter, and are adjustable from 28" to 38" high. Descriptive literature on request to the Manderscheid Co., 810 Fulton St., Dept. BB, Chicago 7, Ill.

NEW WIZCUT FILE PROVIDES NON-CLOGGING FEATURE

Heller Brothers Co. announces an imregier browers co. announces an improved curved-tooth file, the Heller Vixen Wizcut File; it provides a unique non-clogging feature, obtained by incorporating in the design serpentine-like



chip-breaking grooves, superimposed on the curved contour of the milled teeth.



According to tests, this serpentine-like tooth design clears the file of chips readily, and avoids loading even with soft metals.

Wizcut cuts with a shearing action, whether the file is pushed straight ahead or at an angle, without retaining small chips which would scratch the surface being filed. Descriptive literature is available upon request to Heller Brothers Co., 880 Mount Prospect Ave., Newark, New Jersey.

CUNNINGHAM METAL TAGGING OUTFIT

A new metal tagging and tag embossing outfit, designed to provide a permanent and efficient method of identifying billets during storage in yards prior to the rolling operation, is announced by M. E. Cunningham Company, Pittsburgh, Pa.

The outfit has numerous warehousing and industrial applications wherever ferrous, non-ferrous or wooden products require permanent identification.

Interchangeable embossing type is quickly set up in the embossing unit. After embossing with a light hammer blow, the tag is placed in a fixture which bends it to fit over the hammer face and into the hammer clamps provided, at the same time punching a special heat treated nail through the tag. The nail is driven into the steel billet, permanently attaching the tag for quick, easy identification.



Tags will not wash or rub off regardless of weather or operating conditions.

For further details write the M. E. Cunningham Co., 228 Carson St., Pittsburgh 19, Pa.

YOUR LATHE WORKS "FULL TIME"

LACO LATHE TURRETS

Yes, time ordinarily required to switch tools, is used for production by employing ENCO Lathe Turrets. Use an ENCO 12 station turret tool post as an all-purpose tool holder. 3 working positions for each tool. Indexing spaced 30" apart. It mounts square and rectangular tools and standard boring bars and autoff blades. Time saved soon pays for your ENCO turret, after that, clear profit. Get all the facts in our free "30 Models" catalog.



Model R-41/2

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See us at Booth 648, Machine Tool Show, Chicago, Sept. 17th.

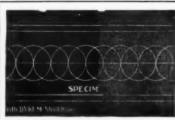
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DYKEM STEEL BLUE STOPS LOSSES making dies & templates

Simply brush on, right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed layout lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

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means better production at a lower cost

Efficient tool designing in post-war's competitive production is a "must". Our experience quarantees you tools - designed for economy of operation, resulting in your increased production at lower

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DIAMOND <acme>TOOLS

Diamonds vary in quality and it is important to use the proper kind for a given job. "Bargain diamonds" are not an economy.

If you don't know diamonds know your diamond dealer. Our 45 years in this field merits your confidence.

CME DIAMOND TOOL CO. 15 MAIDEN LANE, NEW YORK, N. Y.



PACKAGED PRECISION

MACHINISTS HAVE LEARNED TO RELY ON DE-STA-CO Arbor Spacers and Shims for milling, slitting, gang-saw set-ups and for stimming gears and bearings. De-Sta-Co long-life steel Spacers are packaged in a standard range of sizes from 3/4" to 4" hole diameter, up to 5½" outside, thicknesses from .001" to .125", all with keyway. Shims are stamped and coined to commercial tolerances in the same preferred sizes, without keyway.



Special spacers—thicknesses greater than .125"—are also available in popular sizes, machined from bar stock, hardened and ground, with standard keyways and thickness identifications.

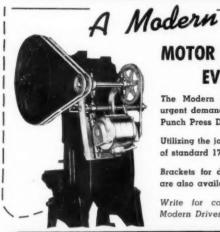
Handy spacer kits of 19 graduated decimal thicknesses are stocked by Mill Supply Dealers in principal industrial centers. Order your Packaged Precision Today.

Your De-Sta-Co Toggle Clamp Catalog No. 47 is waiting for you. Send for it!

DETROIT STAMPING COMPANY

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Detroit 3, Mich.



MOTOR DRIVE FOR EVERY MACHINE TOOL

The Modern Motor Drive shown here fills an urgent demand for an easily mounted economical Punch Press Drive.

Utilizing the jackshaft principle, permitting the use of standard 1750 R.P.M. Motors.

Brackets for direct drive from motor to flywheel are also available from stock.

Write for catalog showing complete line of Modern Drives for other machine tool equipment.

THE NICHOLS ENGINEERING COMPANY ... CHICAGO 12, ILL.

For Quantity Turning MOREY AUTOMATIC TURNING LATHES

Maximum output with minimum effort Takes full advantage of tungsten carbide tools

Investigate!

MOREY MACHINERY CO., Inc. 410 Broome St. New York 13. N. Y.

NEW TOOL CUTS AND BENDS CORE WIRE

The Redford Iron & Equipment Co. announces a new Cutting and Bending Tool which can be either bolted to a stationary bench or held in a vise, and is useful for cutting, bending and duplicat-ing core wires and other wire parts up to



5/16" in diameter. The manufacturers state that it will also cut and bend band iron up to 1½" x 1". The accessory is ruggedly built and the knives and bending pins are replaceable when necessary:





10" to 24" swing \$49.50 to \$125.00 Write for bulletin

MASTER-TAPER COMPANY 126 N. Clinton St. Chicago 6, III.

Exclusive Mfrs. of Taper Attachments

the Redford Cutter and Bender is of particular value to the foundry, and useful in any machine shop requiring the specialized operation which this tool performs.

ruther information on The Redford Cutter and Bender will be supplied by the Redford Iron & Equipment Co., 21315 W. McNichols Road, Detroit 19, Mich.

CHICAGO WHEEL ADOPTS SIMPLIFIED PRICING SYSTEM

Chicago Wheel & Mfg. Co. have adopted a new quantity pricing system on their grinding wheels, identical to the system which they have employed for years on mounted wheels, incorporating many advantages over the old, cumbersome schedule of discounts.

Now anyone can find the price on a grinding wheel, or other Chicago abrasive products, without a great deal of calculation and the need of a slide rule.

This new system of pricing Chicago wheels has been heartily endorsed by purchasing agents who have seen it. A copy of this new schedule, making it easy to select and order the exact wheels for any job, will be sent on request to Chicago Wheel & Mfg. Co., 1101 W. Monroe St., Chicago 7, Ill.

KEYSEATERS BURR



Mill keyways in the run or on the ends of shafting already erected - save money on alteration, erection, and repair work.

Made in 4 sizes, for hand or motor operation.

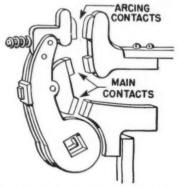
Write for Bulletins and prices.

JOHN T. BURR & SON 429 Kent Ave.,

Brooklyn, N. Y.

ARC RESISTING ELECTRICAL CONTACTS

Silver-molybdenum electrical contacts possessing excellent arc resisting characteristics are in production by the Gibson Electric Co. The new contact material is supplied in two grades: Gibsiloy



M-10, and M-12, the latter with a higher percentage of molybdenum. Because of its higher refractory content, Gibsiloy M-12 is used on heavy circuit breakers where greater mechanical and electrical stresses are encountered. Gibsiloy M-10 is used on smaller size circuit breakers handling lower pressures. The contacts are suitable for use as arcing tips in either air or oir circuit breakers, also as contacts in other oil immersed apparatus, such as transformer tap changers.

Gibsiloy silver - molybdenum contacts combine hardness with conductivity. Grade M-10 has a hardness of 75 Rockwell B, with 50% of the conductivity of pure silver, and Grade M-12 has a hardness of 85 Rockwell with 45% conductivity. Contacts are made in individually molded shapes for each application, thus eliminating machining operations. Additional information furnished by Gibson Electric Co., 8362 Frankstown Ave., Pittsburgh 21, Pa.

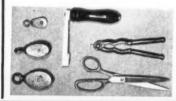
COMBINATION REDUCING REGULATING VALVE AND PRESSURE GAUGE

The Dayton Rogers Manufacturing Co. of Minneapolis Minnesota, announces a combination reducing regulating valve and pressure gauge, made in four sizes, ¼", ¾", ¼" and ¾" pipe size connections. This accessory reduces the line of primary pressures to a desired lower working pressure.

_Cold Riveting

CAPACITY FROM 1/64" dia. 2" dia. SOLID RIVET

SEND US sample assemblies to be riveted and returned for your inspection and approval along with production data and quotations on necessary High Speed Hammer to perform riveting work. No cost or obligation for this service.



High Speed Hammers made in 10 sizes and with horizontal gaps to handle any riveting job. Multiple headed units to form 2 or more rivet heads at once are available.



THE HIGH SPEED HAMMER CO., INC. 311 Norton St.



IMMEDIATE SHIPMENT

from stock—the famous MASTERCRAFT 700-R and 800-R compound slide and rotary milling and layout table. A leader since 1936. Convert your drill press into a vertical mill for those light jobs. Eliminate expensive lathe face plate holding fixtures by using a Mastercraft table for precision boring and turning of multiple diameters. Consult your dealer or write to

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Optical inspection tools—Microscopes— Projectors — Magnifiers — Time-saving Specialties for the Toolroom.

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GEORGE SCHERR CO., INC. 202-G Lafayette St., New York 12, N. Y.

secondary pressure, automatically maintaining such pressures as required on the pneumatic tools used on shop airlines.

The pressure gauge records the amount of air pressure used on the tools or apparatus, pressure of which is regulated or controlled by the pressure regulating valve. Each unit is provided with two rubber shock absorbing vibration dampeners so that when the unit is mounted on a given piece of equipment, all machine shock is eliminated, thus protecting both the reducing regulating valve and the pressure gauge.

These units can be used on all shop air lines for regulating air pressures from 5 to 150 lb. psi. and record all working pressures used on the gauge furnished with each unit.

COMPANIES MERGE

Lindberg Engineering Company, Chicago, manufacturer of heat treating furnaces and electrical equipment, and Fisher Furnace Company, Chicago, manufacturer of non-ferrous melting furnaces, refractories, and blowers have recently united their organizations, according to an announcement by L. A. Lindberg, President, Lindberg Engineering Co. Under the new arrangement the Fisher organization will be known as Fisher Furnace Division, Lindberg Engineering Company, Mr. Kenneth D. Hoke, former Vice President of Fisher Furnace Company will head this division. Fisher furnace manufacturing and office activities have been moved to the main Lindberg office and plant at 2444 W. Hubbard St., Chicago. Refractories will continue to be manufactured at a second plant located at 5535 N. Wolcott, Chicago.



PALMGREN NO. 83

ROTARY TABLE with double cross and rotary feed. 8" diameter table. 4\%" overall cross feed. Weight 28 lbs. This compact unit complete for only \$49.50.

Write for Circular No. 10

Chicago Tool & Engineering Co. 8384 South Chicago Ave., Chicago 17, III. Phone Sagingty 9675



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GO

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ACCEPTED!

THREAD RING GAGES

No wonder more and more industries are adopting this gage as standard. Its revolutionary design assures wear life 5 to 7 times longer. And maintains accurate inspection. Just try the Woodworth Thread Ring Gage on your extra tough job—and you, too, will standardize!

Wire or write for folder No. 46R at no obligation.

5-PLUS FEATURES

- 1 Greater accuracy and stability
- 2 Longer wear life
- 3 Less weight
- 4 Positive identification
- 5 Positive adjustment

ACCURACY YOU CAN TRUST

WOODWORTH

N. A. WOODWORTH CO., SALES DIVISION . 1300 E. NINE MILE ROAD . DETROIT 20, MICHIGAN COMPLETE LINE OF PRECISION GAGES . DIAPHRAGM CHUCKS . CONE-LOK JIGS.

for Better Belt Joints

To keep belts in service longer, use only GEN-UINE Clipper Belt Hooks applied with Clipper Belt Lacers.

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Clipper Hooks are made of the finest quality wire— BETTER than ever before—produced for our exclusive use. Hooks hold with firm, sure grip — give longer satisfactory service.

and Clipper Belt Lacers!

The Clipper No. 9 Portable
Lacer laces belts up to 6
inches wide in one quick,
easy operation. Under powerful pressure hook legs
are embedded flush with
the surface of the belt
and points clinched,
making a perfect joint.
Phone your mill supply
jobber for a demonstration!

CLIPPER BELT LACER COMPANY, Grand Rapids 2, Michigan, U.S.A.



8-SPINDLE ADJUSTABLE DRILL HEAD

The Commander Mfg. Co., Dept. BB, 4225 W. Kinzie St., Chicago 24, announces a new 8-spindle Multi-Drill which they say increases the productive drilling cacapacity of single spindle drill presses eight times.



Quickly attached to any drill press, the new Multi-Drill will drill 8 holes at one stroke in any hole pattern on or within a 9" circle; minimum center distance is ½". The new 8-spindle model incorporates the same design and operating features of the 6-spindle Multi-Drill. The manufacturer states that fast, easy positioning of the spindles to any hole pattern is accomplished by loosening one nut on each of the 8 locating arms, positioning the spindle, and tightening the nut.

The housing and gear case are made of aluminum alloy, the gears are hardened and ground and the universal joints are of heavy duty, high torque block type construction.



ECLIPSE FURNACE ELIMINATES

The Eclipse Automatic Shop Furnace has been redesigned and is now made of fabricated steel instead of castings. The unit is fully enclosed; the working parts are completely housed, as protection against dust and damage, eliminating danger of electrical contacts.

The arrangement of the working parts has been streamlined. The McKee Eclipse Centrifugal Blower is driven by a direct-connected motor, requiring no transmission. A McKee Proportional Mixer regulates the proportion of gas and air.

The furnace comes completely assembled, and requires little floor space; after setting up, it is necessary only to connect gas and electrical lines.



The Eclipse Shop Furnace is designed for shops requiring a tool-room furnace for hardening punches, dies, and small tools; designed for carbon and intermediate steels, it can also handle high speed steel. Bulletin D-1, describing this model and other Eclipse Shop Furnaces is available upon request to the Eclipse Fuel Engineering Co., 750 So. Main St., Rockford, Ill.

"Adjust-angle" Knurl Holder Many patterns using only straight knurls

By patent adjustment of angle, straight knurls cut wide variety of patterns on work up to 2½" dia. Shank to fit your turret.

FAMOUS JIG VISE



Saves hundreds of toolmaking hours

The Multi-purpose Vise serves as repeat-operation fixture on all kinds of machines. Usable plain or with attachments, guides, stops, special jaws, etc. Sizes up to 124 lbs.

Request Bulletin 41

giving full details of applications and prices.



GRAHAM MFG. CO.

50 Bridge St., East Greenwich, R.I.

Power Facing and Boring with ONE Tool Head

CHANDLER DUPLEX

- All operations in one set-up.
- Press, and Milling Machine.
- 3 Power feed engaged and disengaged instantly.
- 4 Adjustment for boring made in increments of one-tenth.
- 5 Cutting bar takes any position in Tee Slot of Slide.
- 6 Power feed for facing assures smooth, uniform movement of tool across work.
- 7 Any style shank available. Shanks are interchangeable.

Precision Constructed: feed screw and worm gear ground from solid; bronze feed nut and bushings.

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Prompt Delivery.



MEAVY DUTY MODELS 3 sizes of slide travel 2-1/2", 3-1/2", 4-1/2" Boring Capacity 26".

CHANDLER TOOL CO.

514 OHIO AVE., MUNCIE, IND.

SCHMIDT MARKING AND NUMBERING

This tool is designed for serially numbering automobile and truck frames. It eliminates errors through hand stamping or pneumatic make-shifts which number by impact pressure. It produces clean, uniform numbering, and it marks in a smooth rolling operation using a barrel-shaped head.

The marking cycle consists of swinging the tool into position with the frame between the anvil and number wheels. Pressure on the pistol grip switches moves the head sideways in either direction, marking as it moves. The current is automatically cut at the end of each stroke. The wheels are provided with eleven spaces for the omission of a number or numbers, if required.



Numbers are changed by pressing the hand lever at the right of the head. This lever changes any desired wheel as designated by the selector on the horizontal bar in front of the head. Each stroke of the lever advances the selected wheel to next consecutive number.

The maximum capacity range of this machine permits marking of stock from 050" to 312" thick by using different anvils. Anvil is adjustable up to .110" variation by means of a set screw. The machine will mark frames varying plus or minus .020" at any anvil setting.

The marking machine is a product of Geo. T. Schmidt, Inc., 1802 Belle Plaine Ave., Chicago 13, Ill. SPRING & PRESSES

POWER AND FOOT

For riveting, staking, stamping and similar operations on small light parts. Constructed to compensate for variation in thickness of the work and to deliver a UNIFORM BLOW AT EVERY STROKE.

M-110 (illustrated) motor driven to eliminate fatigue factor of foot operated press—similar press M-130, equipped to operate by compressed air.

OTHER T& F MACHINES

Duplex Spline
Millers — Medium Duty and
High Speed
Sensitive Drilling Machines.

Send for Bulletin



THE TAYLOR & FENN CO. HAR

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FAST, ACCURATE SPACING

Graduated in thousandths, you have plus or minus .0005" at your fingertips with

DAYTON ROGERS ADJUSTABLE SPACING COLLARS

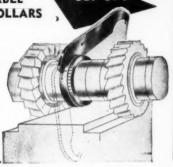
SIDE MILLING CUTTERS

GANG MILLING



Made in 12 standards for cutter arbors from 7/8" to 2". Write for illustrated Bulletin 120-7.

DAYTON ROGERS MFG. CO. 2849 12TH AVE. SO., MINNEAPOLIS 7, MINN.





NEW Model 70



Numbering Machine

Machine and Shank all

The most efficient method of stamping numbers into metal. Repeats the same numbers until changed. Model 70 NUMBERALL Machines are used in all industries to mark various parts. Stamps numbers, etc., quickly . . neatly. Perfectly aligned. Much better marks are produced by these machines than by single stamps or steel type, and at a far lower cost. Shank for Hand or Press and with any number of wheels from 3 to 20.

Write for Bulletin BB-70.

Improved Type Holders, Hand or Press Style. Super Quality Steel Type.

MBER4

STAMP & TOOL CO

Type is easily, quickly loaded and unloaded. Simplest construction. A pin holds the type securely. No screws



NUMBERALL STAMP & TOOL CO.

NEW TIMING DEVICE INCREASES OPERATOR SAFETY

Air-Hydraulics, Inc. announces a Timing Device to be used on their Air-Hydraulic Presses. The action of the device is reverse under pressure, automatically completing the cycle of each ram stroke after delivering the full predetermined pressure. Without the timing device, the operator must hold down the button until the down stroke is completed. Formerly, premature release of the button meant application of less than the full predetermined pressure set on the control gauge, resulting in a loose assembly, or other faulty operation. The Timing Device eliminates this possibility, providing instantaneous reset, and split-second accuracy.



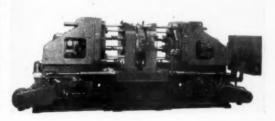
The illustration shows the new 6-ton Air- Hydraulic Press equipped with the Timing Device and two push button controls. Double controls provide a safety feature, since both of the operator's hands must be used to start the ram cycle. The operator merely presses the buttons for complete cycle. The unit may be set for automatic multiple cycling in all types of assembly, forming, and marking. The operator simply has to mount the work units on the indexing fixture; the rest of the operation is automatic. The Timing Device is set to suit the speed at which the operator can most efficiently feed the machine. Its use assures fast and uniform pressure squeeze without impact shock in assembly operations of ceramics and other fragile materials. Further information is available from Air-Hydraulics, Inc., 401 Broadway, Dept. BB, New York 13, N. Y.

TWO WAY MACHINE FOR THRNING AND THREADING

A new machine, designed and manufactured by Baker Brothers, Inc., Toledo, Ohio, employs an unusual method of handling, turning and threading on a high-pro-duction basis. Model 30 HH is a two-way opposed floor type unit machine for operations on steering knuckle pin, upper arm support. Each unit is furnished with a 4-spindle fixed center multiple head for hollow milling chamfering. and and heads provided with two additional drivers for

operating lead screw spindles for external threading, using collapsible die heads. Lead nuts for the threading operation are mounted on the fixture uprights. These uprights also carry bushings for supporting tools at cutting stations No. 2 and No. 3,

Both heads are arranged with double motor-drive; one for the four spindles. and the second motor with reversing controls of the advance and withdrawal of



the lead screw. This machine is furnished with a 4-station hand indexed trunnion fixture: each is station arranged to ac-

commodate two parts.

The sequence of operations is as follows: At station No. 1—Load and unload two parts. At station No. 2—Chamfer both ends of knuckle pin, %" diameter and 7/32" depth. At station No. 3—Turn the O.D. 0.7855" to depth of 1-3/16". At station No. 3—Turn the O.D. 0.7855" to depth of 1-3/16". At station No. 3—Turn the O.D. 0.7855" to depth of 1-3/16". At station No. 3—Turn the O.D. 0.7855" to depth of 1-3/16". At station No. 3—Turn the O.D. 0.7855" to depth of 1-3/16". tion No. 4-Thread 11/8" depth, on 0.7855" diameter.

MODEL 7051 Interior size-51/2"x51/2"x6" Exterior size-15"x15"x17" 115 V.A.C. only-1.2 K.W.-\$123

All prices f.o.b. factory Philadelphia WRITE-For full information and your nearest dealer. DEALERS - Desirable territories open. Write for our interesting offer.

SOLE SELLING AGENT

GILBERT S. SIMONSKI 401 N. Broad St., Philadelphia 8. Pa.

New DeLuxe and Super-DeLuxe Models to be announced next month



MODEL 7053 Interior size—8"x8"x10" Exterior size — 18"x20" 24"—115 or 230 V.A.C. 3 K.W.—\$206

Deluxe and Super-**Deluxe Furnaces**

Standard models, with automatic heat control. These will be continued without change.



MODEL 7052 Interior size—12"x12"x10" Exterior Size—22"x22"x24" 230 V. A.C.-





HYDRAULIC MOTORS ADDED TO GEROTOR MAY LINE

Hydraulic motors, in sizes up to 8.7 h.p., have been added to the Gerotor

h.p., have been added to the Gerotor May line of hydraulic devices, including pumps, pump units, valves and cylinders. Embodying the basic Gerotor principle with its low relative speed of the two elements, the newly developed Gerotor motors convert hydraulic power into rotary power. Their operating characteristics offer advantages in many industrial applications. These motors can be stalled under load without damage, operated safely in explosive and corrosive atmospheres, and installed in small, confined spaces. Their low rotational inertia permits rapid changes in shaft speed and direction.



Gerotor hydraulic motors are available in models ME and MH (see cut), each with plain, base or flange mounting, for direct coupling, belt, chain or gear drive. More detailed information may be ob-

tained by requesting Catalog Section G-108 from the Gerotor May Corp., Mary-land Ave. and Oliver St., Baltimore 3, Maryland.

GRUNOW PILLAR POST UNITS FOR DIE-SETS

A. W. Grunow, Inc., announces the manufacture of the Grunow Pillar Post units, containing the Grunow phosphor bronze contractable bushing, adjustable for fit and future wear. The maker claims that these units make a more accurate and smoother operating die set, because of the diamond-bored special steel alloy housings, which are accurate to a square-ness of .0001" in 6". The posts' ends are tapered, easy to remove for die grinding. Descriptive literature includes full scale templates of the five sizes; sent on re-quest to A. W. Grunow, Inc., P. O. Box 2, West Orange, N. J.



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ECONOMY TOOL & MACHINE CO. WISCONSIN MILWAUKEE 14.

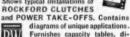
ROCKFORD COMPACT

Design

These compact, powerful, multipledisc clutches are helping product engineers reduce size and weight between the driving and driven units of machine tools, lift trucks, overhead cranes and a wide variety of other equipment. Readily fit into product designs, accommodating great torque capacity within small size. Precision grinding insures perfect fit on the shaft.

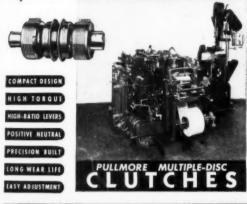
Send for This **Handy Bulletin**

Shows typical installations of ROCKFORD CLUTCHES





diagrams of unique applications. Furnishes capacity tables, dimensions and complete specifi-



ROCKFORD CLUTCH DIVISION WARNER

1309 Eighteenth Avenue, Rockford, Illinois, U.S. A.

CERWECO STEEL APRON BRAKE

NOW AVAILABLE IN 6 AND 8 FT. 14 GA. 1 10 FT. 16 GA. CAP



EASE AND SIMPLICITY
HAND OPERATED
ENGINEERED AND BRACED
TO DO THE JOB RIGHT
FULLY GUARANTEED
QUICK DELIVERIES

WRITE FOR CIRCULAR

WM. C. JOHNSON & SONS MACHY. CO.

1211 Hadley St. St. Louis 6, Mo.

NEW FRICTION CLUTCH FOR V-BELT DRIVES

A new V-Belt Friction Drive Clutch is announced by the V-Belt Clutch Co., Wilshire Blvd., Los Angeles 5, Calif. Designed to grip or release directly on V-belts, the "Ball-lok" clutch units may be used either as driving or driven pulleys. They are suitable for application in connection with many types of machines where compactness, light weight, control, dependability, and safety are factors, according to the manufacturers.

Four sizes are available from 3¼" to 5" sheave diameter; two are applicable to 3¼" shafts, and two to 1" shafts.

In operation, the clutching action is the grip of the sidewalls of the pulley against the belt. When the clutch is opened, the belt slackens and idles on a free-running, grease-sealed ball bearing, with no attendant belt drag or creep.



On fixed flange of the sheave is an integrally attached part of the hub and the inner race of the sealed ball bearing belt idler. Four free-rolling steel balls ride in grooves in the hub and carry all the turning and locking forces. All parts turn with the shaft.

The engaging action which grips the belt, and at the same time forces it away from the idler bearing and into working position is smooth and shockless in load pick-up. Additional information regarding this new accessory will be furnished by writing to the manufacturer.

EQUI=GRIP Speed Vise

FAST PRODUCTION
With
PRECISION & SAFFTY



SPEED—Single lever action. A short down pressure on toggle lever closes and locks the jaws. Upward to unlock and open them. What vise can give greater speed with safety?

WIDE OPENING—When needed, full lever action retracts live jaw up to 11/4 inches.

PRECISION—Dove-tail ways with quick and simple adjustment for wear permit always holding jaws and base in original alignment, so necessary in fixture work.

Bottom, flush sides, and top of jaws on Madel A-3 ground to perfect tight angles.

SAFETY—Clamping action is downward. No danger of operator's hand slipping into cutters.

Available in 3" and 6" sizes with special jaw plates or fixtures for each.

GEORGE - ANDERLE MANUFACTURING CO. 2116 SALEM AVENUE DAYTON 6, OHIO

CARBIDE USERS



ADAMAS Preformed Blank Deliveries Are Averaging Under One Week!

Send for ADAMAS'
"Aids to Carbide Users"
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do you know...

that ADAMAS preformed tool blanks can save you time and money?

- Eliminates time-consuming grinding to required shape.
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- Savings for outweigh slight additional cost.

TRY ADAMAS PREFORMED CARBIDE BLANKS ON YOUR NEXT JOB — AND PROFIT BY THESE ADVANTAGES.

ADAMAS

CARBIDE CORPORATION
40-30 23rd STREET, LONG ISLAND CITY, NEW YORK

Procucers of top quality corbide for cutting tools, dies and wear resistance-both standard and special.



It stands to reason: your best chance of finding the right blade — the blade that'll cut down "rejects" and replacement cost — is offered by a complete line . . . the Star line. Your Star supplier can give you a wide choice. He has a Star blade for every job a hack saw or band saw can do. No matter what you're cutting — metals, plastics or other non-metallics — he can furnish you with the Star that'll cut it cleaner, faster, better — the right blade to cut costs for you.



HYDRAULIC SPEEDVISES BUILT LIKE A LATHE

Foot operated hydraulic Speedvises of advanced design, with V-ways and gibs are announced by the Studebaker Machine Co. Elimination of hinging action under pressure and adjustment for wear is effected by built in steel gibs set at 45° angle in V-ways of semi-steel. These features assure accurate and positive gripping pressure between vise jaws, machined to .001" tolerance.

Speedvises are entirely self-contained, requiring no outside power source. With a few strokes of foot operated hydraulic pump units, operator can build up pressures from a feather touch to 7½ tons, and can control jaw action from rapid to very slow.

Built for heavy duty service of rugged steel and semi-steel construction, they are used for production line work, clamping, forming, punch-press work, bending, etc. They are portable, and can be mounted horizontally or vertically.



Two models are available; No. 750 "Torpedo", having 7½" maximum opening between jaws; 4½" jaw depth; 5¼" jaw width; 7½ tons maximum jaw presure; No. 500 "Bullet" having 5" maximum opening between jaws; 3" jaw depth; 4¼" jaw width; 5 tons maximum jaw pressure. Bulletin with full information is available from the Studebaker Machine Co., 1221 So. 9th Ave., Dept. BB, Maywood, Ill.

Save Time



TURNING MILLING GRINDING

WITH

NICHOLSON EXPANDING MANDRELS

Save the time lost in making or looking for solid arbors. Set of 19 Nichol-

son expanding mandrels does the work of 209 solid arbors.

OTHER ADVANTAGES OF THESE WIDELY USED TOOLS

PRECISION—No parts to wear out and cause distortion.

RUGGEDNESS—Sure grip on heavy work.

For all bores, 1" to 7". Hardened stainless steel. Two types, sold singly or in sets. Used in shops the nation over.

Bulletin 1043

W. H. NICHOLSON & CO., 117 Oregon St., Wilkes-Barre, Pa.

Valves • Traps • Floats • Steam Specialties



Marschke Swing Frame Grinders take the wheel to the work piece. The smooth spindle rotation and correct speed assures maximum metal removal with minimum wheel wear.

With mass to resist vibration, even the largest sizes of Marschke Swing Frame Grinders supply maximum maneuverability. The wheel is easily tilted to a full 90 $^{\circ}$ right or left of the normal vertical position—thus allowing freedom in controlling the wheel angle to follow a gradually curving surface.

Marschke Swing Frame Grinders are available with wheel sizes of 16", 20" and 24". Write for further details.





VONNEGUT BRUSH BACKED SANDER HEADS



VONNEGUT ELECTRIC MOULDERS



MARSCHKE GRINDERS & BUFFERS

ONNEGUT MOULDER CORPORATION

1805 MADISON AVENUE . INDIANAPOLIS 2, INDIANA

EISLER WELDERS

The Eisler Engineering Co., Inc., destance welding machines has issued a new catalog describing the specific line of small spot welding machines manufactured by the company.

The 36-page catalog covers Spot Welding Machines and Butt Welders in the range of ½ to 3 KVA—manual, air, or operated by electronic devices—used in the manufacture of radio tubes, incandescent lamps, optical work, sheet metal and wire work. Pertinent technical data are given and various welding problems explained.

Copy of catalog is free upon request to Dept. BB, Eisler Engineering Co., 740 S. 13th St., Newark, N. J.

TOWMOTOR SURVEY OFFERED ON BALL BROTHERS CO.

The part played by Towmotor fork lift trucks in the materials handling job at Ball Brothers Company, Muncie, Ind., is the subject of a new, illustrated lift truck job study published by Towmotor Corporation. Ball Brothers Company, manufacturer of glass jars and bottles, seals and caps, has recently modernized its handling system to accommodate the huge task of moving materials to and through production that has a volume equivalent to 50 box cars and 20 trailer trucks each day. Copies of the illustrated study are available free from Towmotor Corporation, 1226 East 152nd Street, Cleveland 10, Ohio.

FIRE CONTROL

Most lives are lost and most injuries occur at the time of fire because of panic crazed impetuousness, warns a new booklet, "Fire Control—Its Equipment, Personnel and Procedures," published by the National Conservation Bureau, accident prevention division of the Association of Casualty and Surety Executives.

The 24-page booklet, designed for plant managers and supervisors, was compiled by a committee of engineers who are expert in fire prevention and is being distributed thru member companies of the Association. "It is intended," says a foreward to the booklet, "to present the correct procedures for handling emergency equipment to control fires in work places and to point out how industrial fires can be controlled or eliminated."

GREAVES GEARS

Greaves gears headline the 10-page catalog and folder just issued by Greaves Machine Tool Co. Specifications and prices of Standard Keyseats, Rawhide Pinions, Laminated Phenolic Pinions and Fabroil Gears are featured in the catalog, as well as a set of rules applying to spur gears.

The folder highlights bakelite (laminated phenolic) gears which, according to the folder, "operate successfully under severe corrosive conditions that would destroy some metal gears . . . can run completely submerged in water without special attention."

Both folder and catalog may be obtained from Dept. BB, The Greaves Machine Tool Co., Cincinnati, Ohio.

SALSBURY MOTORS & CLUTCHES

Salsbury Motors have issued two fourpage brochures, one on their Model 600 6 hp Engine, the other on their Automatic Clutch.

The first brochure demonstrates, by means of a blueprint, how the 6 hp engine is built into 56 lbs. of weight and describes in detail the specifications of the engine.

The second brochure points out the construction features of the Clutch, as well as dimensional data, and centrifugal automatic action with velvet-like power pick-up.

Brochures may be obtained from Dept. BB, Salsbury Motors, Inc., 1201 Lexington, Pomona, Calif.

WESTINGHOUSE ELECTRON TUBE WALL CHART

Basic information on operation, types, and applications of electron tubes is presented in a new 25" by 36" wall chart offered by the Westinghouse Electric Corporation.

Printed in eight colors on heavy linen paper, the chart is reinforced top and bottom by tin strips, and hinged for hanging. It shows how the electron is freed in electron tubes, basic structural types of electron tubes, action of gasfilled and vacuum tubes, and six primary functions of electron tubes—rectification, amplification, generation, control, changing light into electricity, and changing electricity into radiant energy.

Price of the Electron Tube chart is \$2.00 and it is available from the Westinghouse Electric Corporation, 306 Fourth Avenue,

Pittsburgh 30, Pa.



Write for literature and price lists.

blanks.

HURON MACHINE PRODUCTS

14831 W. WARREN DEARBORN, MICHIGAN





MERCOID CONTROLS

Designed to automatically regulate electrically operated equipment in accordance with changes in temperature, pressure, vacuum, fluid level of mechanical movement

CATALOG SENT UPON REQUEST



KENNAMETAL INTRODUCES NEW TOOLS

Kennametal Inc., Dept. BB, Latrobe, Penna., announces a line of cutting tools having clamped-in solid round Kennametal inserts which the makers claim to facilitate output on high-production, repetitive jobs requiring complex tool setups.

These tools—designated as Styles 3RS and 6RS (right and left hand)— comprise a solid Kennametal round clampedon end in a heat-treated steel holder. supported by a back-up adjusting screw. Each end of the tool provides a circular cutting edge. A small section of this edge, depending upon the depth of the cut, bears against the work. When this sec-tion becomes dull, the clamping screw is loosened, and the Kennametal round is rotated to provide a new cutting edge. After being indexed several times, until all of the cutting edge of one end has become dull, the round is then turned end for end to provide a second cycle of cutting. Once the tip is set, it provides a correctly positioned cutting edge thruout the sequences of indexing of both ends. After both ends of the Kennametal round have become dull, it is removed from the holder, reground, and is ready for another double cutting cycle.

NEW HAND TRUCK HAS CAPACITY OF

The Handees Co., merchandising management, announces a new combination purpose truck, designated as Model 88-R. The truck is 54" in height, and is equipped with four solid rubber, oilite bearing wheels, 8" x 2". Overall width of the accessory is 24".

The truck is furnished complete with one web strap and a 24" wide removable nose plate, making it especially suitable for handling large refrigerators and other



bulky items which require a wide supporting surface at the nose of the truck. Simple removal of the nose plate converts the truck into a conventional hand truck for ordinary purposes.

With a load capacity of 1000 lbs, this rugged truck should have a wide appeal, according to its manufacturers, the Handees Co., 201 No. Gridley St., Bloomington, III.

The method of supplying power to early tools around the end of the 18th century would cause a modern machinist to tear out his hair. The "power" consisted of man's muscles being applied to a rope wound around the material being worked. A tug on the rope turned the work. After each tug the rope had to be rewound, and then the same process started all over again.



PUNCHES and DIES



A large range of round, flat, square, and oval sizes is carried in New York stock.

Special Tools and Odd Sizes Made to Order

Catalog No. 8 covering our complete line of metal-working tools available.

T. H. LEWTHWAITE MACHINE CO. 311 East 47th St., New York 17, N. Y.



CIRCLE CUTTING
ATTACHMENT
Included as
STANDARD EQUIPMENT
with this Machine



WRITE FOR BULLETIN

SIMPLIFIES Maintenance
SPEEDS Production
SAVES Manpower

The Libert has amply proved its advantages by turning out top production—shearing flat or formed sheet metal, internal or external, plain or irregular shapes rapidly, accurately, cleanly!

Equally effective in maintenance work, *Libert* is cutting costs to rock bottom. Edges are smooth, need no finishing. Unskilled operators produce accurate work at once.

Sizes up to 60-in. throat, 10-gauge capacity.

LIBERT MACHINE COMPANY

Green Bay, Wisconsin



FIGURING OPTIMUM STRESS FOR TORSION SPRINGS

By Edward J. Rantsch. M.E., P.E.

Figuring torsion springs for a machine part is a difficult operation for many individuals. A common mistake is the specification of too high a unit stress, causing the material to pull beyond the elastic limit. The result can be a faulty spring, especially if there are only a couple of coils on the spring, which would either not operate at all or would snap almost immediately.

The remedy lies in estimating the maximum number of coils possible, so that the stress will be between 60,000 lbs. and 90,000 lbs. An adequate housing space should be furnished for the spring; too often the dimensions of the housing are calculated before the dimensions of the spring, and turn out to be inadequate.

Sketch 4 shows what is meant by the angle in degrees turned through. This view of a torsion spring shows the deflection of the end. The other end of the spring is held stationary.

In the designing of springs of this kind, it is advised that they be wound open, that is, with a small space between the coils so as to avoid coil friction. Therefore, a space is found between the coils, somewhat more for a spring made of square material than that for a spring of round material. See sketches No. 2 and No. 3.

Calculations for torsion springs follow: M equals the torque in in-lbs.

A equals the angle turned through in degrees

D equals the mean diameter of coils of spring in inches

d equals the diameter of wire in inches
L equals the effective length in inches
of wire used in the colled portion (does
not include the material required for
the ends)

N equals the number of active coils

S equals the unit stress in wire (can be between 60,000 and 90,000 lbs. sq. in.)

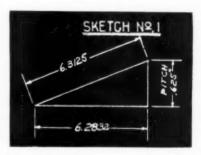
E equals the modulus of elasticity of steel material in bending 30,000,000

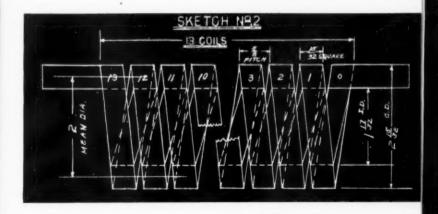
b equals the breadth of wire in inches t equals the thickness of wire in inches W equals the load in lbs.

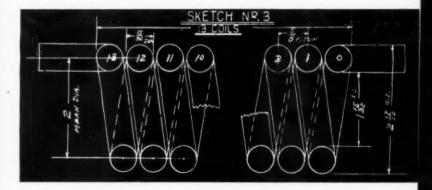
F equals the deflection in inches for the angle turned through

The calculations for a torsion spring having 13 active coils, 5%" pitch, made of square vanadium steel rod 15/32" square, where D is 2". A equals 40, and S equals 60,000. Then M will be:

equals 1,030 inch-lbs. And since the radius of the mean diameter equals 1", W equals 1,030 lbs.







Formula for angle "A" turned through in degrees for round wire is:— 360 N D S

E d

A will be: $\frac{688~M~L}{E~b~t^3}$ To get L of the

equals A in degrees.

straight rod necessary to make 13 coils not counting the stock for the ends, %" pitch requires 6-5/16" per coil for a mean diameter of 2", and for 13 coils would require 13 x 6-5/16" equals 82.0625". (See sketch No. 1.) Therefore:

688 x 2 x 82.0625

 $30,000,000 \times .46875 \times .103$ equals 40.15 degrees.

Checking back: For the deflection in

inches we have: F equals $\frac{12WR^2L}{EBt^3}$ or

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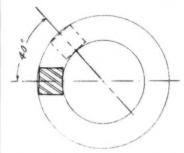
YON-Raymond corporation 04 Madison St. Greens, N. Y.

2SLR 2 x 60.000 x 82.0625 x 1 equals

E+ 30.000,000 x .46875 equals .700" measured on the mean dia. circumference D. The circumference of a 2" mean diameter is 6.2832". Therefore: 700 × 630

equals 40 degrees. 6 2832

For a round rod of 17/32" diameter. which is the equivalent of a 15/32" sq. rod



Angle turned through = deflection "F" End view of torsion spring. Sketch No. 4

as given above, 13 coils, $\frac{5}{6}$ " pitch, and where A equals 40 degrees, M equals $\frac{d^3S}{150 \times 68.000}$.150 x 68,000

equals equals 1000

10.2 10.2 inch-lbs. torque, or W equals 1000 lbs. F would be:

2LRS 2 x 82.0625 x 1 x 68.000 equals

30,000,000 x .53125 equals .700" as before, and therefore the angle in degrees will be the same as above for the square rod or 40 degrees. NOTE: The stress here is raised to 68,000 lbs. per sq. in.

See sketch No. 2 for square wire torsion spring.

See sketch No. 3 for round wire torsion spring.

NOTE: The space required to get this spring into place would have to be about 10", allowing for the ends. The actual length of the square rod spring requires 8-7/16", without ends, and for the round rod spring 8-9/16".



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MONROE CO. DEVELOPS USEFUL HANDLING EQUIPMENT

Material handling equipment, which eliminates manual emptying of steel boxes and tubs filled with small parts, thus saying more than 20% in handling costs, has been announced by the Monroe Auto Equipment Co.

Known as the drop-bottom skid box, the new unit accomplishes the emptying job by gravity thru a hinged bottom sup-ported by two heavy, removable pins. Contents of the box—forgings, castings, stampings, screw machine parts or other small parts-may be unloaded to floor or work table without the necessity of the worker performing time - consuming. "lost-motion" operations.

Tests of 200 of the new units in plants of the Monroe Co., where as many as 10,000 tons of steel per month are fabricated into small parts, preceded the introduction of the boxes and their addition to the Monroe line of standardized ma-

terial handling equipment. It was shown that savings in material handling costs between unloading docks and assembly lines and between operations on assembly lines were 20 per cent and greater, ac-cording to the size of part and quantity handled.

The boxes are constructed of corrugated hot rolled steel, and are available in six sizes with capacities ranging from 1500 to 4000 lbs. Each box is equipped with skids for floor unloading. Offered separately are stands to hold the boxes at a height of 41" and provide waist high work tables to hold materials released when the boxes are emptied. The drop-bottom skid boxes, as well as other material handling equipment units, originally were developed by Monroe to reduce manufacturing costs in the fabrication of these products in the company's own plants. Further information and specifications will be supplied by writing to the Monroe Auto Equipment Co., Dept. BB. Monroe. Mich.

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News of the industry.

ASME CHOOSES NOMINATING GROUP

Nine leading members of the American Society for Metals (7301 Euclid Ave., Cleveland) have been appointed by Society president A. L. Boegehold to the ASM nominating committee for 1947.

According to announcement by W. H. Eisenman, national secretary of the Society, the duty of the committee will be to represent the Society in the selection of nominees for the offices of president, vice-president, treasurer, and two trustees

Elections will be held at the Annual Meeting of the Society in Chicago in October of this year as a part of the National Metal Congress and Exposition.

Members of the nominating committee are chairman A. H. d'Arcam-

bal, vice president, Pratt and Whitney, West Hartford, Connecticut, representing the Hartford Chapter: C. K. Lockwood, Shawinigan Chemicals, Limited, Montreal, Quebec, Canada, representing the Montreal Chapter; S. P. Watkins, Manager of the Development Engineering Department, Rustless Iron and Steel Division, Baltimore, Maryland, representing the Baltimore Chapter; Dr. R. J. Radebaugh, University of Rochester, Roches

MODERN WELDS TANK

A 250 gallon pressure tested tank to hold Butane Gas, was fabricated by The Modern Welding Company of Bowling Green, Kentucky.

There are six equal sides that were dished or pressed

There are six equal sides that were dished or pressed out on a hydraulic press to form a perfect sphere. The tank is 48 inches in diameter and is 300 pounds pressure

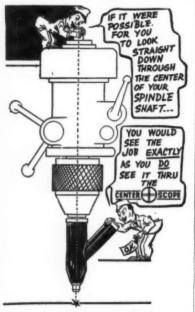


test. It required 384 feet of welding with high tensile steel electrodes and took E. R. Smith 16 hours to complete the welds.

Photo and data courtesy the Hobart Brothers Company.

ter, New York, representing the Rochester Chapter; Arthur Winston, Assistant to the Director, Magnesium Division, Dow Chemical Company, Midland, Michigan, representing the Saginaw Valley Chapter; Thomas G. Harvey, Monarch Steel Company, Indianapolis, Indiana, representing the Indianapolis Chapter; Dr. R. L. Dowdell, School of Mines and Metallurgy, University of Minnesota, Minneapolis, Minnesota, representing the Northwest

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3829 San Fernando Road Glendale 4, California Chapter; W. E. Burndrett, chief inspector, Hughes Tool Company, Houston, Texas, representing the Texas Chapter; and Floyd Anderson, Gardner-Denver Company, Denver, Colorado, representing the Rocky Mountain Chapter.

RYERSON STEEL HOLDS OPEN HOUSE AT LOS ANGELES PLANT

Refreshments and dinner were served to approximately 4000 visitors who attended the Open House May 15 at the Los Angeles plant of Joseph T. Ryerson & Son, Inc., steel distributors. Hosts were F. A. Purdy, plant manager, and T. L. Kishbaugh, assistant manager. The new plant has been in operation since October, 1946.

Everett D. Graff, president, Harold B. Ressler, vice president and general manager of sales, Ainslie Y. Sawyer, assistant to the president, William Seymour, Jr., assistant vice president, and Thomas Z. Hayward, assistant general manager of sales, were among the Ryerson executives who welcomed guests.

The Los Angeles plant, twelfth in the Ryerson nationwide system, is the first to be placed in operation on the West Coast. The warehouse building covers an area of some 200,000 square feet and is equipped with the latest high speed types of cutting and handling machinery. It was engineered and designed to provide maximum efficiency in all operations involved in receiving, stocking, and shipping a wide variety of hot rolled, cold finished, reinforcing and specialty steels.

WHEELCO MAINTAINS FIRM POLICY

In an attempt to help normalize business, Wheelco Instruments Co., 847 W. Harrison St., Chicago 7, Ill., has returned to a policy of firm price commitments on orders calling for shipment beyond regular delivery schedules.

The Company regards this move as an expression of confidence in the future of their merchandising plans as well as in the general development of business.

NATIONAL TOOL AND DIE ASSSOC. ENTER-TAINS SHOP OWNERS AND GUESTS

At the 3rd Annual New England Conference held May 16 under the auspices of the National Tool & Die Manufacturers Association, of Cleveland, Ohio, 350 shop owners and guests heard Clayton

R. Burt, Board Chairman of Niles-Bement-Pond Company, express belief in bright opportunities ahead, in spite of present narrow profit margins.

Dudley Harmon, Executive Vice President, New England Council, reported that since 1939, the metal-working industries of New England had doubled their employment, which is now greater than in the better known textile and leather industries.

George S. Eaton, Executive Secretary of the National Tool & Die Manufacturers Association, told of plans for seeking tax relief for small business. Arrangements for the conference were handled by the four New England local tool and die associations, and Frank Mitchell, Mitchell Machine & Tool Co., Springfield, was chairman of the Conference Committee.

CLEARING MACHINE CORP. BUYS HYDRAULIC MACHINE CO.

Clearing Machine Corp., Chicago manufacturer of mechanical and hydraulic presses, has purchased the Jackson Hydraulic Machine Co., Inc., of Rockford, Ill., according to an announcement by R. W. Glasner, President of Clearing Machine Corp.

The new one-story crane serviced plant recently occupied by the Rockford company will be used for the manufacture of certain parts of Clearing presses, to relieve the crowded conditions and volume of business of the Chicago plant. It will also be used as a laboratory for the development of new products under the guidance of Paul Jackson, who established the Rockford business in 1941. Mr. Jackson becomes vice president and member of the board of directors of the Clearing organization.

HYDRO-BORER CO. MOVES

The Hydro-Borer Company, manufacturers of self-contained hydraulic machines, announce the moving of their plant and executive offices to larger quarters at 511 South Redondo Blvd., Inglewood, California. Mr. Ben Johnson, general manager, will continue to supervise all operations of the company including sales. He states that an aggressive sales promotion program is planned, both in the automotive and industrial fields.

Hydro-Borer models are designed for boring the pin and crank end of connecting rods of most makes of automobiles and trucks, for bearing resizing; and for many aircraft and industrial applications.

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I. D. A. A. CONVENTION HELD IN ATLANTIC CITY

At their convention in Atlantic City earlier this year, the Industrial Diamond Association of America featured efforts to adapt further industrial diamond tools to industry, to assist industry in the conservation and proper use of diamonds and to publicize those efforts.

The general meetings were under the chairmanship of I.D.A.'s President, Mr. Harvey B. Wallace, re-elected for 1947, who is also President of the Wheel Trueing Tool Co., Detroit. There were also constructive talks by 1946 First Vice-President, I. J. Meade and Vice-President Charles J. Koebel, President of the Koebel Diamond Tool Co., Detroit, elected 1st Vice-President for 1947. Other Directors are Fernand Durand, Cochaud Wire Die Corp., New York, Frank Køebel, J. K. Smit & Sons, Inc., New York, Harold DeS Mendes, Mendes Diamond Sales Co., New York, James A. Ross, Sprague & Henwood, Inc., Scranton, Pa., H. R. Spandel, New York, Charles Ullmann, Associated Diamond Co., New York, Stephen Hofman, New York, and I. J. Meade, U. S. Industrial Diamond Corp., New York,

Past President Ray H. Morris of the American Society of Tool Engineers addressed the opening session of the annual meetings, with a speech on the advantages of trade associations for the improvement of products and the improvement of industrial relations.

An important paper on the need for technological research in diamonds was prepared in London for this convention by the eminent engineer, P. Grodzinski. In his paper the author stressed the necessity for surmounting, thru research, a final hurdle—the direct application of diamond tools to steel.

A development of interest to all mechanized industries as well as to industrial diamond groups, was the report of the Diamond Powder Sub-Committee, headed by Mr. Frank Koebel, President, J. K. Smit & Sons, Inc. of New York and other cities. Most of the members of this committee are on the National Permanent Committee of the Bureau of Standards for Diamond Powder and they have recommended a new standard classification that will be of vastly greater value to general industry than that which was established by the Government during

the war.

There were three General Sessions, three Board Meetings and Meetings of the Research, Importers, Public Relations, Toolmakers, Diamond Powder, Finance, Diamond Dies, and Membership and Practices Committees.

The Executive Manager of I.D.A. is Athos D. Leveridge who also functions as Secretary-Treasurer and makes his head-quarters at 501 Lexington Ave. N. Y.

ANNOUNCE CONSOLIDATION

The Yankee Precision Products Co., 50 Bartholomew Ave., Hartford, Conn., designers and builders of electronic and mechanical gages, tools, and equipment, announces consolidation with Modern Tools, Berlin, Conn. Offices and manufacturing facilities are to be located in the Berlin plant. Modern Tools will continue operation as a division of Yankee Precision Products Co. Edmond Morancey will be General Manager and W. Krause, General Sales Manager.

CONSOLIDATED ABSORBS SELLERS MACHINE TOOL DIVISION

Consolidated Machine Tool Corp. of Rochester, N. Y., recently acquired the Machine Tool Division of William Sellers & Co., Inc. of Philadelphia, it was announced by Arthur H. Ingle, President.

The Sellers manufacturing, sales and service facilities will be moved to Rochester, where their line of tools will be coordinated with those of Consolidated and will bear the name of William Sellers & Co. Division, Consolidated Machine Tool Corp.

The Sellers' line includes horizontal boring, drilling and milling machines; planers, boring mills; plate planers, turret track turning machines; drill and tool grinders and special machines.

The most widely known patent possessed by the Sellers organization was one granted in 1862 on the spiral gear planer. The formula was adopted in the United States as the Sellers Standard Screw Thread, but ultimately came to be known as the United States Standard Screw Thread and is still the standard.

Consolidated Machine Tool Corporation was formed in 1922 and has since grown markedly in size of plant, number of employees and volume of output.



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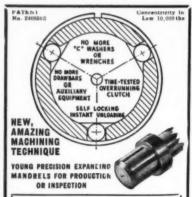
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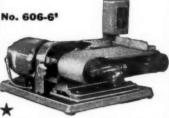
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Available LITERATURE

GULF PUBLISHES PHOTO REVIEW OF LUBRICANT RESEARCH

A picture story of its research program for developing industrial lubricants has just been published by Gulf Oil Corp.

The brochure, entitled "Better Lubricants for Industry Through Research," presents a panorama of lubricant development ranging from modern techniques of oil discovery through refining, analysis, testing, and the creation of future products.

Forty-eight photographs, chiefly taken at Gulf's laboratories at Harmarville, show advanced lubricant research devices, including pilot plants, endurance testing machines, micro - laboratory equipment, electron microscopes and spectrometers. Captions carry a running commentary.

A copy of this 24-page booklet may be had by writing to the company at Dept. BB, 3800 Gulf Building, Pittsburgh 30, Pa.

READY TOOL CO. CENTERS

The Ready Tool Company, 554 Iranistan Ave., Bridgeport 5, Connecticut 4-page Bulletin 471 describes RED-E Ball Bearing Centers recommended for use with carbide cutting tools. Includes full descriptive information, engineering data, prices for Shank, Ball and Roller Bearing and Outside Spindle Types.

Copy may be obtained by dropping card to Dept. BB, care of the company.

SYNTHETIC CUTTING DIE

Machinery Lubricants, Inc., 31 St. James Ave., Boston 16, Mass., has available a 6-page, illustrated brochure describing the application of "Silver-Chip"—the synthetic non-petroleum cutting oil developed and being marketed nationally by this company. Copy of brochure will be furnished to personnel of metal-working plants when requested on company stationary.

SEVERANCE MIDGET MILLS

Specifications and pictures of the complete line of Severance Midget Mills are presented in the new "Faster Finishing" catalog No. 16 now being distributed by Severance Tool Industries Inc., Saginaw, Michigan

The catalog contains information on the five principal Severance tool types: Midget Mill; Deburring Group; Tube Cutter Group; Countersink Group; and Miscellaneous Types, including pencil mills, gear tooth rounders, edging mills, hand and carbide files, and trepanning cutters.

Catalog also contains: tables of recommended cutting speeds for the various Severance Tools, including those with chatterless type teeth, those ground from the solid after hardening, and Carbide Mills; specific information and hints relative to the correct application of Severance tools in obtaining production efficiency.

Catalog may be obtained from Severance Tool Industries Inc., 722 Iowa, Saginaw, Michigan.

EARLE GEARS

This new 24 page catalog describes, in pictures, blueprints and text, the various types and sizes of Earle gears and Earle special machinery.

Included are such products as spur gears and pinions, herringbone and hobbed type gears and pinions, worm gears and wheels, various non-metallic gears, racks, sprockets, sheaves and special machinery used in operating dredges, bridges, gates, hoists, mills and others.

The catalog includes necessary ordering information and a section devoted to formulas. Copies of the catalog can be obtained by writing Dept. BB, The Earle Gear and Machine Company, 4707-17 Stenton Ave., Philadelphia 44, Pa.

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SPECIFICATIONS FOR STAINLESS STEEL WELDING ELECTRODES

With issuance of the Tentative Specifications for Corrosion-Resisting Chromium and Chromium-Nickel Steel Welding Electrodes (AWS Designation: A5.4-46T; ASTM Designation A298-46T) the AWS-ASTM Committee on Filler Metal has completed one more step in a program which is intended ultimately to provide a complete set of specifications for all types of filler metal used in welding ferrous and non-ferrous metals by the various welding processes.

The new specifications, patterned after the Tentative Specifications for Iron and Steel Arc-Welding Electrodes for mild and low-alloy steel electrodes, provides classification and test requirements for twenty-four classifications of electrodes.

The classifications are grouped in six series covering the stainless steel types commonly identified as 19-9 (or 18-8), 25-20, 18-12 Mo (or 18-8 Mo), 19-9 Cb (or 18-8 Cb), 16 Cr and 4 to 6 Cr Mo. Each series includes classifications for an all-position a.c.-d.c. electrode, and all-position a.c.-d.c. downhand electrode and an a.c.-d.c. downhand electrode and an a.c.-d.c. downhand electrode.

To provide users of the specifications with assistance in the selection of the proper electrode for a given application, there is included as an appendix the Guide to the AWS-ASTM Classification of Corrosion - Resisting Chromium and Chromium-Nickel Steel Welding Electrodes in which the particular properties and uses of each classification are discussed.

Copies of the Specifications in the form of a 13-page, 6 x 9 in. booklet may be obtained at 25 cents each from the American Welding Society, 33 West 39th Street, New York 18, N. Y. or from the American Society for Testing Materials, 1916 Race Street, Philadelphia 3, Pa.

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STEEL BASE IN 24" COILS

Bonded steel base metals in coils \%" to 24" wide are the subject of a folder published by American Nickeloid Co. of Peru, Ill. The folder describes finishes of chrome steel, nickel steel and copper steel, available in coils for the manufacture of buttons, name plates, tube clips mouldings, stampings of all kinds, etc. In addition, there are attached samples of each finish. Folder may be obtained by writing Dept. BB, American Nickeloid Co., Peru, Ill.

SCHMIEG SPRAY BOOTHS

Schmieg Industries, Inc., utilizes blueprints and photographs to describe operation of their various types of Centri-Merge Spray Booths in new 8-page folder.

Booths are completely air conditioned, with even flow of fresh air over entire area of spray painting operations. Detailed description is included of Centri-Merge system, thru which water streams moving in planned fashion eliminate much of the fire hazard attendant upon spray painting operations.

Folder may be obtained from Dept. BB, Schmieg Industries, Inc., 300 Piquette Ave. Detroit 22 Mich.

BELLOWS AIR POWER

The Bellows Co. of Akron, Ohio has released a 16-page bulletin on "Controlled-Air" Power

This new bulletin describes the use of the Air Power in replacing repetitive manual operations in a wide range of manufacturing processes, and shows specific applications resulting in production increases ranging up to as high as 600%.

The booklet may be obtained by addressing card to Dept. BB, The Bellows Co., 798 N. Main St., Akron, Ohio.

B & W NICKEL STEEL TUBING

This ten page, illustrated bulletin, is directed to those handling alkaline solutions, paper mill black liquors, liquefied gases and other low temperature media, and mildly acidic conditions. It describes the mechanical and working characteristics, heat treating behavior, and weldability of the newly developed 9 per cent nickel steel tubing, and suggests fields of application. Write for bulletin number TR-508 by addressing Dept. BB, The Babcock & Wilcox Tube Co., Advertising Division, 85 Liberty Street, New York.



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GIDDINGS & LEWIS MOLDING MACHINE

A new Giddings & Lewis six-page folder outlines points of interest about their new Vertical Injection Molding Machine for plastic molds. A full page pic-ture of the machine is prominently displayed as are pictures of the interior. played as are pictures of the interior, showing the toggle mechanism, heating cylinder and injection plunger, the hydraulic equipment and control station.
Folder may be obtained from Dept. BB, Giddings & Lewis Machine Tool Co.,

Plastics Divn., Fond du Lac. Wis.

CROSS CHAMFERING METHODS

A new booklet by The Cross Company. Detroit, Michigan, builders of special machine tools, explains in photographs and diagrams the Cross "60" Series Machines which they have developed for pointing and chamfering spur, helical, and bevel gears; also splines. Complete specifications are included.

Written entirely along practical lines, it explains the actual generating action utilized in Cross' continuous rotary cutting motion. A slow motion description makes the theory easily understood.

Close-up photographs supplement the text by illustrating typical operations such as: pointing internal clutch teeth of a as: pointing internal clutch teeth of a synchromesh second speed automotive gear; pointing teeth of a first speed and reverse truck gear; chamfering internal spline of an aircraft gear; chamfering teeth of a large aircraft timing gear and removing burr; also others.

The importance of economical and accurate cutter maintenance, using the crush wheel process, is stressed and explained in detail.

Free copies of this new booklet are available. Send your request to Dept. BB. The Cross Company, 3250 Bellevue Ave., Detroit 7, Michigan.

BURG TOOL-FLEX

The latest catalog of the Burg Tool Manufacturing Co. shows a number of improvements and additions to their line. The Tool-flex Tool Holder consists of only four parts, metal parts being made of alloy steel, heat treated and finished to close tolerances.

The catalog is four pages in size and tells the specifications and sizes of the Tool Holders available. Catalog may be obtained by addressing card to Dept. MTBB, Burg Tool Mfg. Co., 5028 W. Jefferson Blvd., Los Angeles 16, Calif.

WHEELCO CONTROLS

Wheelco Instruments co., has just issued two bulletins, one a 20-page, three color book, Bulletin Z-6400, "Wheelco Electronic Controls," the other Educational Bulletin No. 5, "Automatic Temperature Control Systems."

perature Control Systems.

Bulletin Z6400 may serve as a condensed catalog, containing listings and specifications on standard Wheelco instruments. A separate four page price list is attached to the bulletin.

The educational bulletin explains Measurement and Automatic Control and the selection of proper Control Systems the selection of proper Control Systems for Process Applications, by means of charts, tables and diagrams. "Thermocouples, Their Placement and Hints Governing Their Use," "Selection of Thermocouple Protecting Tubes" and a listing of A.S.M.E. terminology referring to process and automatic control are treated in sements shouters. treated in separate chapters.

Either booklet may be obtained by writing Dept. BB, Wheelco Instruments Co., 847 W. Harrison St., Chicago 7, Ill.

ROCKFORD PLASTICS MOLDING MACHINE

The Rockford Hy-jector Molding Machine for thermosetting plastics is described in four page folder released by Rockford Machine Tool Co. The salient design feature is the dielectric heating unit. Once the molding cycle is begun with the mechanical measuring of the plastic powder, each step of the sequence takes place automatically. This series of movements is graphically shown in the

A letter addressed to Dept. BB, Rockford Machine Tool Co., Rockford, Ill.

will secure folder.

STEARNS MAGNETIC CLUTCHES

Stearns Magnetic Clutches and Clutch-Steams Magnetic Clutches and Clutches have Combinations, Magnetic Disc Brakes, and Magnetic Separating and Concentrating Equipment are all described in Steams' 20 page bulletin, by means of specifications, detailed drawings, photographs and descriptive matter.

Stearns products are the result of close to fifty years of magnetic engineering experience and are used in metal lathe machinery, Diesel hook-ups, pulp processing, steel mill screw down rolls,

gyroscope control, etc.

Bulletin may be obtained from Dept. BB, Stearns Magnetic Mfg. Co., Mil-

waukee 4. Wis.

Precision.

TAPPING

Leads changed in 90 seconds



PRECISION **TAPPER**

This is a fast rugged production tool capable of sustained accuracy. Flexible and adaptable, it cuts clean screw threads, handling up to ¾" in non-ferrous metal and 0 to ½" in SAE steel. Class 3 and Class 4 gage fits and high production schedule are accomplished in normal operation even with unskilled help.

Tapping speeds are 95 to 350 rpm with reverse speed twice that of forward speed. Taps are guided by precision ground lead screws which are easily and quickly changed. Bulletin 143 gives full details.

> Dealers' inquiries are invited

AND EXPERIMENTAL CO. 716 N. Highland Ave., Los Angeles, Calif.



PRINCIPLES OF RADAR

By Members of the Staff of the Radar School, Massachusetts Institute of Technology. Second Edition. 881 pages. \$5.00. Published by Mc-Graw-Hill Book Company, Inc., New York, N. Y.

Radar has replaced the human eye and ear in detecting presence of objects at great or small distances at any time of day or night. According to the members of the Radar School Staff, it was one of the most important electronic developments of World War II, has demonstrated its importance in military and naval operations, and has immense potentialities for peacetime development.

"Principles of Radar" deals with general principles of radar and describes the parts and functions of radar systems. Accurate analysis of circuits and devices is combined with the smallest possible emphasis on mathematics. Quantitative analysis is stressed in treatment of circuits based on tube characteristics and physical principles.

Rewritten parts include the chapters on Timing Circuits, Indicators, Modulators, Transmit-Receive Devices and Synchros and Serve-mechanisms, and sections on Automatic Frequency Control and Impedance Matching. New material includes Propagation and also the derivation of radar range equation.

The original purpose of this material was that it be used as a text for a course presented to members of the Army and Navy at M.I.T. during World War II. Since electronics seems to be a coming science, this book will no doubt be of interest to technical men in industry.

MACHINE DESIGN

By Louis J. Bradford and Paul B. Eaton. Fifth Edition. 283 pages. \$3.25. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y.

This book is intended primarily as a textbook to be used in machine design courses. The authors are endeavoring to train the student in the basic facts of machine design to enable him to solve problems intelligently and give him general knowledge of approved practice.

New material includes data on fatigue of metals, nature of friction and lubrication and special problems in designing aluminum parts. Other subjects are Friction and Lubrication, Bearings and Sliding Surfaces, Friction Clutches and Brakes, Shafts, Screws and Screw Fastenings, Toothed Gearing and Belts and Chains, all of which are analysed and discussed. Sample problems and solutions are presented.

Kinematics, mechanics, short - cut formulas and graphical methods do not play prominent parts in the book. The authors contend that if the student understands the fundamental equations, he will be able to develop his own short-cut formulas later.

This is a well known text, which has been revised and brought up to date and will provide a reasonable background for the student.

WORK MEASUREMENT MANUAL

By Ralph M. Barnes. Third Edition. 218 pages. Published by Wm. C. Brown Co., Dubuque, Ia.



from 1/4" to 1/2" - from \$1.71 to \$3.75

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MACHINE SHOP EQUIPMENT — 125 page fully illustrated catalog describes a large variety of drills, reamers, cutting and lathe tools, vises, etc.





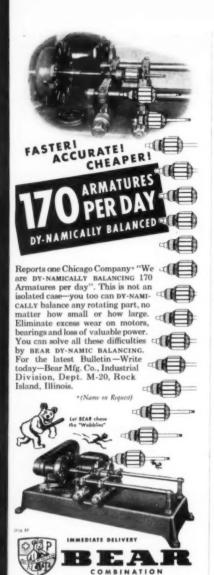
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STATIC AND DY-NAMIC BALANCING MACHINES

Today, time study forms the foundation for many industrial wage systems, and the importance of accurate ratings cannot be overemphasized. Basically, however, time study ratings depend on the judgment of individuals, time study men, whose ratings will be no better than their ability. Therefore, performance records should be checked from time to time and this manual suggests suitable checks.

The third edition of Professor Barne's book has been expanded to include the program described therein. Methods of presentation consist of showing motion pictures of factory operations, getting performance ratings of time study men and comparing their ratings with actual performance ratings previously supplied with the motion pictures.

Detailed instructions are presented for following the experiments which include operations such as making sand cores, nailing two cleats on the end of a box, drilling four holes in hub cap, walking experiment, etc.

A community time study survey for the purpose of comparing one industry's standards with those of others is urged, and one section by Harold Engstrom is devoted to standard data established for operation of punch press, turret lathes, tapper, drill press, etc.

Time study is growing in importance and is limited only by the caliber of men making the studies; a check of ratings occasionally is a practical procedure.

ALLIS-CHALMERS BREAKERS

A revised bulletin on Allis-Chalmers oil circuit breakers, Type DZ-40B, has just been announced by the company. According to the four-page bulletin, this breaker, of moderate capacity for indoor service, is of the oil-tight, enclosed mechanism type with all three poles in one tank, and is capable of wide application to station, substation and industrial service.

In addition to describing the construction of these breakers and listing their extra protection features, the bulletin advises that they are available for electrical and manual remote control operation, lists accessories and provides a table of maximum current, voltage and interrupting capacity ratings together with a reference chart of general dimensions.

Copies of the bulletin, 71B6179B, are available on request from Dept. BB, Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.



NEW METHOD STEEL STAMPS, Inc.

today.

YOST DRILL PRESS VISE



This new Yost vise has been designed expressly for use on drill press operations. Does away with special and costly jig fixtures.

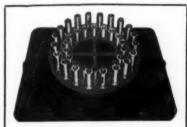
Offered in two sizes.

Vise No.	Width of	Opens	Weight			
	Jaw, Inches	Inches	Pounds			
1D	31/2	31/2 51/2	121/2			

Do you need a vise of ANY type?

Write today for bulletins on the extensive Yost line

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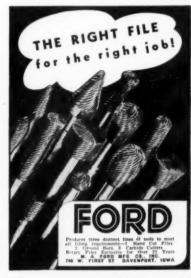


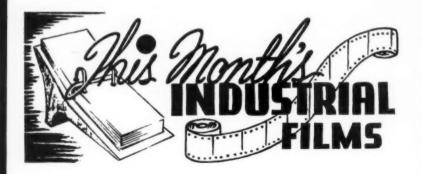
Pictured: a 38-Spindle Heavy-Duty
Drill Head.

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MULTIPLE DRILLING EQUIPMENT

We invite your inquiry.

MICHIGAN DRILL HEAD CO.





GRINDING WHEEL SAFETY

20 minutes. Kodachrome stock. Sound film, 16 mm, Obtainable from Norton Company.

Norton Company Publicity Department Worcester 6, Mass.

Grinding wheel safety seems a rather intangible subject to portray by motion pictures but this film successfully emphasizes some of the more critical factors in the care and handling of grinding wheels and the more important causes of grinding wheel breakage.

It shows how grinding wheels are often damaged by careless handling and incorrect use, the hazard created by dropping a wheel or permitting it to receive a bump or blow, the danger of using unequal or worn flanges and other demonstrations of hazardous practices.

In addition to the usual showings before apprentice groups, schools and foremen's groups, this film is particularly suitable for factory inspectors and safety engineers. This film will be loaned without charge with the understanding that it will be handled by experienced operators with dependable equipment and returned in good condition, express prepaid. Films are shipped from Worcester express prepaid.

Prompt return by express is necessary because the films are booked on a close schedule for showings and delay



Dropped Wheels Should be Checked for Injury

means cancellation of other bookings. Return labels are supplied with the films.

HIGHLIGHTS OF THE ART OF GENERATING AND GEAR MANUFACTURING FOUIPMENT

The Fellows Gear Shaper Co. Springfield, Vermont.

55 minutes. Two reels. Natural colors. Sound. 16 mm. Obtainable from The Publicity Department, The Fellows Gear Shaper Co.

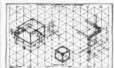
The latest in gear science is covered in this picture - theory, design, tooth action of gears, and their production and inspection. The first of the two reels



Stresses created by eccentricity of the pitch circles.

pictures (1) The Theory and Development of the Involute: (2) Design of Gear Teeth where models are superimposed on drawings to illustrate the basic

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EASY TO MAKE AND READ !

One trial will make you another make you amount steady user of WADE'S ISOMETRIC blue lined paper. Shows all

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principle of gear design; (3) Action and Contact of Gear Teeth where errors and nature of tooth contact are depicted by polarized light: and (4) Applications of the Generating Principle where study is presented of generating principle applied to various shapes.

Reel Two includes (1) Gear Cutting and Finishing Equipment and (2) Gear Measuring and Testing Equipment covering recording instruments for checking involute profiles, helical and other surfaces, and errors in combination

The film is primarily an educational one created by Fellows as a service to industry. It is available to any company. engineering society, technical institute, college or school interested in gear design or manufacture. It may be borrowed without any cost to the borrower. or it can be purchased outright at approximately the actual cost of prints. reels and cans.

New Britain THE ORIGINAL

Swivels 360 degrees horizontally. 100 degrees vertically, to give any angle or compound of angles. Write for Further Information

NEW BRITAIN TOOL & MFG. CO. NEW BRITAIN, CONN., U. S. A.

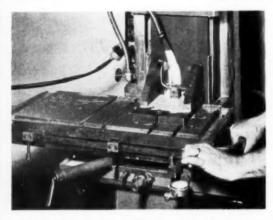
A MACHINE OF THE AGE

Porter-Cable Machine Co. 1714 North Salina St. Syracuse, N. Y.

30 minutes. Sound. Black and white. 16mm. Obtainable from Porter-Cable Company. the wet belt machining method.

Versatility of the method on different materials is proved by the surfacing and grinding of ferrous and non-ferrous metals, glass, plastics, wood, ceramics and other materials.

Among operations featured are removing risers, flashings and parting lines from cast materials; surfacing large, flat areas to close tolerance; chamfering, edging, squaring, round and cutting radii on



A metal removing and surfacing operation is being performed on a wet belt surfacer. Notice the simplicity of the fixture which facilitates rapid loading and unloading.

"A Machine of the Age" relates the story of the famed Porter-Cable wet belt machining method from birth to its maturity as an efficient machine tool adaptable to single piece operations in tool and die rooms as well as to production runs of thousands of pieces. Actual case histories demonstrate the increased surfacing, stock removal and grinding production effected by manufacturers using

single piece operations. The Automatic Feed Table, which substitutes mechanical pressure for hand pressure and makes possible closer tolerances, is also presented.

Interested members of the metal industry may procure the film simply by sending a card to Porter-Cable Machine Company and indicating their willingness to pay return postage.



A REAL HELPING HAND

It's a help that die makers, tool makers, machinery builders and general machinists have long sought a more accurate and surprisingly faster way of transferring blind screw holes.

(a

The Heimann Transfer Screw Set is a self-contained, complete tool. No wrenches or pliers are necessary. Made in Ar to 1" diameters. Sendfor price list.

HEIMANN MFG. CO.

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Urbana, Ohio

Drilling-Boring-Reaming CUT LOADING TIME with ESCO Drill Jigs

Standards — Mijits 50 sizes always in stock

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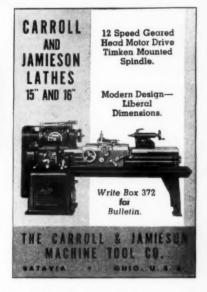




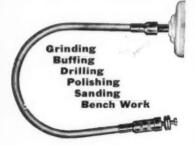
SPEED UP production in multiple operations with push-out type Hall Collet Chuck. Full spindle capacity or over. Tremendous grip over or under stock size to .007—without adjustments...no bearings, friction, heat or loss of power. Instant release without stopping lathe.

Two-inch capacity, now only \$145 One-inch capacity, \$95 Round, square or hex collets, plain - serrated

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FOR EASY



Attach this STOW Flexible Tool Shaft to your own motor!

Every shop should have at least one of these STOW Flexible Tool Shafts. In combination with the proper attachments, mechanics and maintenance men will find it indispensable in hundreds of important operations.

Can be attached to your bench-mounted motor or to portable power unit, either electric or gasoline. Easy to connect and disconnect to various tools. Ample length and easy flexing make it ideal for reaching inconvenient places.

Write for full details, or see your mill supplies or hardware dealer.

A price all can afford at \$15.00 (5-foot model) (6-foot model—\$16.50)

Slightly higher West of Rockies



MANUFACTURING CO.
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Binghamton, N. Y. weakened.

VULCAN HYDRAULIC MULTIPLE-PIERCING

The Vulcan Tool Co. announces a new hydraulic piercing unit, requiring only one operator. The unit illustrated, replacing four punch presses and the necessary sets of dies, pierces a total of fifty-five holes in the four flanges of an 2-foot refrigerator door in a single 7" operation. The unit can be used for either right or left hand doors simply by changing the punches for the hinge holes. Change-over can be made in a matter of minutes.



The piercing principle can be adapted to practically any operation requiring multiple hole piercing. By combining four separate operations, the Vulcan hydraulic piercing unit reduces labor costs, frees punch presses for other production, effects a reduction in space, and increases unit production, according to the manufacturer.

Although designed and built to meet special requirements, the principles developed in this unit can be applied to a wide variety of hole piercing operations. Additional information is available from the Vulcan Tool Co., Dept. BB, Dayton, Ohio.

Sufficient clearance behind the cutting lips of drills must be provided so that the cutting edges can enter the work. Usually 9 to 15° lip clearance is sufficient for average work if the point is ground with the proper angle and the proper clearance, but without the proper contour back of the cutting edges, the cutting lip will be weakened.

AIR-LINE FILTER and AUTOMATIC LUBRICATOR



Removes 96% to 97% of All Water, Birt and Scale from Airline

Air passes through a series of brass discs with 002 anacings, providing the finest degree of filtration obtainable. Then as the air passes through head of Lubricator, oil is

delivered into the purified airline in any desired volume. The scarcity of replacement parts makes the use of these devices doubly important.

A combination of this kind is only as efficient as the filter unit of the assembly.

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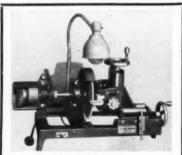


Remove Costly Dust at its Source

Stop the constant menace of machinery break-downs and worker lay-offs due to preak-gowns and worker lay-orts due to fine abrasive dusts in the air with compact, efficient TORNADO Dust Collectors. De-signed for use with individual or batteries of grinding, buffing, polishing machines also

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Breuer Electric Mfg. Co. 5118 Ravenswood Ave., Chicago 40, III.



Patent Applied For

Sharpen Dull Pipe Wrenches

Industries save hundreds of dollars.

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J. C. MOORE INDUSTRIES

Drawer 276



Famous for Stamina

This new, streamlined bench type grinder assures fast, quality finishing on metals, plastics, wood, fibre . . . at low cost. Built to machine tool specifications, Standard D-4 is equipped with improved band tension control and specially designed protective motor hood. 4x361/4" band. The ideal portable unit.

OTHER STYLES AND SIZES IN NEW MANUAL ON FINISHING-WRITE TODAY

E. 38th St., New York 16,

TAPER MASTER makes taper cutting EASIER!

- Cuts tapers from 1/1000 to 4 inches per foot
- Micrometer adjustment down
 to 1/1000 of an inch
- Positive Center Lock, keeps center to micrometer accuracy at all times
- Easy to set up and adjust; requires a minimum of make-ready time
- Fits any standard Morse Toper lathe.



TAPER MASTER fills a long felt need for a simple, practical taper device that is durable, accurate and light weight. It is easily handled by one man.

Accuracy and Speed for One or a Number of Similar Tapers.
TAPER MASTER is made in three sizes:

The No. 2 TAPER MASTER is intended for home shop and light experimental work. It cuts tapers up to 2½ inches per foot. The No. 3 TAPER MASTER is intended for manual training and trade school use, heavy duty tool room or industrial use, and for experimental work shops. It cuts tapers up to 3¼ inches per foot.

The No. 4 TAPER MASTER is intended for heavy duty work in tool rooms or for industrial production setups. It cuts tapers up to 4 inches per foot.

Write for prices and taper desired.

National Distributor
THE MACHINERY AND FACTORY EQUIPMENT CO.
1219 Douglas Avenue Racine, Wisconsin

FORD PLANS TO BUY \$65,000,000 ANNUALLY ON PAGIFIC COAST

Ford Motor Company's (Dearborn, Mich.) plan for obtaining \$50,000,000 more supplies and parts on the Pacific Coast annually is progressing, L. C. Disser, the company's West Coast purchasing representative, said recently, asserting he is "more than satisfied" with results obtained thus far.

"However," Mr. Disser added, "this . . . requires much long-range planning before the ultimate objective can be at-

tained.

The plan would raise total West Coast procurement to \$65,000,000 annually.

Supporting Mr. Disser's views, Al-bert J. Browning, vice-president and director of purchases for company, said that after blueprints after blueprints have been approved approximately nine months pass before production is actually begun by the supplier.

"We are greatly encouraged by the success of our program on the Pacific Coast and have encountered nothing but the finest cooperation from manufacturers in that area," he asserted.

In February II. Henry Ford Ford Motor Compresident. pany Ernest R. Breech, executive vicepresident. Davis, vice-president and director of sales and adver-Mr. tising. and Browning attended buyers' clinics in Los Angeles and San Francisco where more than 2 600 parts were

displayed by the company to 5,000 Pacific Coast manufacturers.

Of the 450 quotations already received, at least 65 are "in line or lower" than present costs of items now being purchased, and several large orders have already been placed with California manufacturers. One of them, an order for 150,000 wheels to be used in California plants came to almost \$1,000,000.

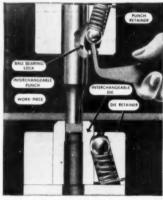
Mr. Disser said that it may take a year or two before the final objectives of the program are reached.



are Zuickly INTERCHANGEABLE

Allied's R-B Interchangeable Punches and Dies are quickly installed for trouble-free production in the metal-working and plastics industries. They are available from stock in *standard* round, oblong and square shapes of almost any required size. Specials of any size, shape or material are promptly furnished to your specifications — and delivery dates are dependable.

Write today for large illustrated R-B Catalog





ALLIED PRODUCTS CORPORATION

Department 20 • 4644 Lawton Ave. • Detroit 8, Michigan

If you want MORE PARTS per hour LOWER COST per part

the BARKER WRENCHLESS CHUCK can do it faster, better and stand up to it longer. Where the run is continuous on turrets, engine lathes, cutting off machines, drill presses or any other type of chucking machine, these Chucks will increase production and pay for themselves in 60 to 90 days while

doing it. See how a Barker Wrenchless Two-Jaw or Three-Jaw Chuck can speed up production in YOUR plant.

Write for bulletin 201 today



CHICAGO 12

THE REAL PROPERTY OF THE PROPE

I save Time, Worry and Production Costs by using these MEAD

CYLINDERS

These simple, adaptable, single-acting Mead Air Cylinders will solve your work-holding problems quickly, economically! Available in numerous vertical or horizontal mountings and in a wide range of sizes all featuring spring-returnaction. Write for new Mead Air Power Catalog describing single and double acting Cylinders, Valves, Presses, Clamps, Work Feeders, Vises, Impact Hammers, Collet Fixtures and other air-operated devices.





TIMKEN OPENS BRANCH PLANT IN ONTARIO

A new branch plant of the Timken Roller Bearing Co., Canton, Ohio was formally opened today in St. Thomas, Ontario, Canada, with a brief ceremony in the plant, followed by an "Open House."

In expanding its operations to Canada, the Timken Company is seeking to offer better services to present and prospective customers in the Canadian markets.

St. Thomas is located about mid-way between Detroit and Windsor on one side and Buffalo and St. Catharines on the other, six railroads run through it and excellent trucking routes are available.

The plant has 225 employees, 30 of whom are supervisory personnel who were in the Canton bearing factory for several months learning operating methods and policies.

The main plant building is of concrete, brick and welded steel construction having 40-foot saw-tooth bays. Overall dimensions of the plant are 160 by 300 feet, with a single-story office section, 40 by 140 feet, in front of the plant. The office has a basement under its entire area. All construction is of the latest and most modern type for plants of this character.

A power plant and boiler house, 50 by 100 feet and c o n t a i n i n g two 300-h.p. steam boilers fired by fuel oil, two 750k.w. motor gen-

erator units powered by two 800 h.p. motors, air compressors and other auxiliary equipment, is located behind the main building.

The smokestack on the boiler house is 140 feet high and has a tapered inside diameter of from 10 feet, three inches, at the bottom, to six feet, six inches, at the top. It was constructed, should the plant be expanded, to handle two additional boilers besides the ones now in use.

The architects are Messrs. Prack & Prack of Ontario, with Dinsmore & Mc-Intyre as general contractors.



FEWER SAW BLADES Needed

When sharpened with E. C.

Properly sharpened metal cutting saws last longer. In fact E.C. Combination Metal Cutting Circular Hack and Band Saw Grinder has demonstrated it can pay for itself within a year by the savings on blades alone.

Blades not only last longer, but take a maximum bite with minimum destructive effect on teeth. Write for Bulletin.

THE WARDWELL MANUFACTURING CO. 3165 Fulton Road, Cleveland 9, Ohio

Jriple Jaw CHUCK

The Almond Three-Jaw Drill Chucks were pioneers in the field of drill chucks. Since 1872 they have played a necessary part in the logical procedure of machine developments.

Almond Chucks are furnished in nine sizes with capacities from 3/16 to 1". They are made for heavy and light duty types with taper or threaded arbor hole—to fit all machine tools and portable tools.



Write for complete details.

The Original
Manufacturers

of Drill Chucks

T. R. ALMOND CO.

ASHBURNHAM, MASS., U.S.A.



This new versatile production and maintenance tool can save money in every plant. 7-ton capacity; 3° stroke; 3½° ram; foot-power unit, 10,000 p.s.i. Send for bulletin.

A - 4 Post Press Frame

"C" Clamp or small gap press
 Mobil-Powr Ram

B — Spreader Sleeve Adaptor

E — Jack Adaptor

F - Spreader or Pusher

G — Spreader or Pusher couplings

H - Puller Plate to be used with rods

J - Lifter Adaptor

K & L-Spreader or pusher rods 3" to 30"

M - Foot Power Unit

C and M comprise the Mobil-Powr Unit. Other items are accessories.

MUNTON MANUFACTURING CO., Franklin Park 2, III.



PERSONNEL DIRECTORS CONSIDER INDUSTRIAL PROBLEMS

According to the National Association of Personnel Directors, Washington reports of new labor legislation have Iulled personnel directors into believing that revision of the Wagner Act will eradicate many of the labor relations difficulties of today. The N.A.P.D. believes that nothing can be farther from the truth. The basic element is the manpower shortage.

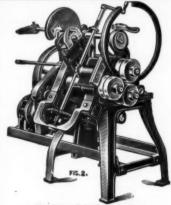
To get more work done, plants have to compete for labor already employed by others, and personnel directors have virtually to do somersaults to keep their present working force happy. All of which means that regardless of how the Wagner Act is amended, the problem of labor relations will continue in 1947 — perhaps more pertinent than ever before.

At their meeting in the Hotel New Yorker, New York, on June 30, July 1 and July 2, the Association considered industrial aspects of personnel work, in an effort to solve labor problems.

Active participants at the meeting were Russel F. Vice Ahrens. President in Charge of Person-nel, United Air Mayor Lines; Lloyd E. Roulet, Mayor of William Ohio: Director of Hoofe. Industrial Relations. Archer-Daniels - Midland Company, Minneapolis: Roy Bryant, Director of Personnel, Durkee Fa-mous Foods Company; A. B. Cockshaw, Personnel Director, Otis Ele-vator Company;

Dr. Dwayne Orton, International Business Machines Company; Harry H. Willett, Personnel Director, Cleveland Cap Screw Company; Dr. Peter Swanish, Illinois Institute of Technology.

Personnel directors have only to examine the classified want-ad section of the daily newspapers to see how great the demand is for labor. Manpower shortage gives labor increased bargaining power, and the employe today is demanding shorter hours, greater job security, longer paid vacations and other fringe benefits, accompanied by lower productivity.



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PRT 4-12 ARC-WELD FROM 5 TO 250 AMPERES! The Larkin 250 S G combines an amazingly wide range-5 to 250 There's a Larkin Welder For Every Purpose

G-E PLASTICS PART USED IN U. OF CALIFORNIA'S NEWEST ATOM SMASHER A 650 pound plastics part said to be the

largest ever produced by General Electric's plastics division, Pittsfield, Mass., has been shipped from the G-E factory to be used as a component part of the University of California's newest atom smasher, it has been announced.

Representing one of the foremost projects ever attempted by the Company's plastics division, the largest synchrotron part is eight feet in diameter. Together with nine additional G-E plastics parts,

they will form the vacuum chamber of the atom smasher where the physical properties of the plastics offer unusual strength and stability combined with electrical insulation

General Electric said that its conto tribution synchrotron design consisted of seven rings and three vacuum manifolds made of a lowpressure laminated construction to form the vacuum chamber in which electrons accelerated. The rings, G. E. said, were de-signed to bear the compressive load of the magnet.

The plastics rings were made of layers of glass fibers bonded with a polyester resin. A specially developed General Electric varnish was used for the manifold construction, officials said.

After molding. the plastics parts were machined at the Watervliet, N. Y. Arsenal and returned to Pittsfield

for assembly and further treatment with the G-E varnish to augment the vacuum tightness, strength and density. The in-terior of the chamber will be evacuated and the exterior surrounded by helium before being checked for leaks.

According to University of California scientists, the new synchrotron is designed to produce a beam of 300,000,000 volt X-rays and combines certain features of the cyclotron with those of the betatron. Weighing less than either of the other two types, the new atom smasher can explore materials of higher voltage.

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EVERLASTING FASTENINGS

EXECUTIVES CONFER

Top manufacturing executives and supervisory foremen from many states gathered in a series of three day National Metal Trades Association Plant Management Conferences, according to a statement released in Chicago by Homer D. Sayre, NMTA Commissioner. The first meetings were held June 8-11 and 11-14 at the Dell View Hotel, Lake Delton, Wisconsin, for NMTA members from states Ohio and west.

Eastern NMTA conferees met June 22-25 at the Sagamore Hotel, Bolton Landing, Lake George, New York. Theme for both, "Management Essentials for the Job Ahead."

The meetings were arranged to give top management an opportunity to sit with their shop executives and participate in discussion of timely problems and mutual responsibilities. Through exchange of ideas based on practical experience. the conferees worked toward the im-provement of pro-duction and human relations within their individual plants.

Principal speakers at the Lake Delton meeting included: Howard Goodman, Vice President of Chicago's Goodman Man ufacturing "What's Company. Ahead in Industrial Relations"; Dr. W. R. Spriegel, Chairman of the Department of Management. School of Commerce. Northwestern Univer-"Industrial sity, "Indu Organization Organization and Control"; and Jo-seph T. Meade, Ex-

ecutive Assistant to the President, Cornell College, "Industrial Management and Public Relations."

The Lake George conference headlined: Alan C. Curtiss, Vice President of the Scovill Manufacturing Company of Waterbury, Connecticut, "What's Ahead in Industrial Relations"; Dr. C. Canby Balderston, Dean of the Wharton School of Finance and Commerce, "The Role of Line and Staff ir Industrial Relations"; and Hartley Barclay of the New York Times, "Industrial Management and Public Relations."

Featured at both meetings were a series of sectional conferences.

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of 25 to 33 per cent. small low-air velocity fans may be mounted on tubes or radiators. Heavier overloads require high-velocity - air fans. either mounted on the transformer or on portable frames standing for around the transformer. Depending characteristics transformer. the overloads of 40 to 60 per cent may be carried when these powerful more fans are used"

Mr. Lennox said that on large transformers temperature oil can be lowered by the use of forcedoil-cooling with exchangers or coolers, a method requiring installa-tion of an oil pump in addition to the coolers.

For serious heating emergencies. speaker sugthe gested spraying water over the ex-ternal surface of the tank, cooling tubes and radiators. Although this method can inoutput 67 crease per cent, it is not

recommended for continuous operation because the surfaces of the tank may corrode and the spray nozzles may become clogged with impurities.

Outlining the considerations in the safe overloading of transformers, Lennox said, "With modern methods of oil preservation such as the conservator, the sealed tank and the automatic gas seal. the aging of oil has almost been entirely eliminated as a factor in transformer life.

A curve showing overloads producing a given hot-spot temperature for different oil temperatures was shown.

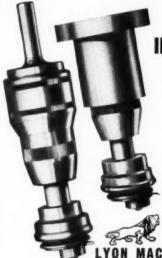
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SUMMER PEAK LOADS IN SOUTH IMPOSE SPECIAL TRANSFORMER COOLING PROBLEMS

Temperature rise of oil over ambient is the only transformer heat factor which can be reduced in sections of the South where peak loads occur during summer months, due to cotton ginning and air conditioning loads, John S. Lennox of General Electric's Transformer Division told members of the Southeastern Elec-tric Exchange at a recent meeting in Augusta, Georgia.

"Cooling may be accomplished by a variety of means," he said. "For overloads



The Lyon INTERNAL GROOVING TOOL

Its versatility saves costly preparation time — provides precision grooving of single or multiple grooves at a production rate — plus economy of set-up time — and low initial cost. The LYON has been designed for making internal grooves to tolerances of .001" using any drill press, turret lathe, radial drill or automatic equipment.

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SUN OIL ASSIGNS RESEARCH PROJECT TO TEMPLE UNIV.

A fundamental bio-chemical research project, which seeks to discover the reactions involved in the chemistry of animal and plant life, has been assigned by Sun Oil Company to the Temple University Research Institute, it was announced by Arthur E. Pew, Jr., a director of Sun Oil Co. of Philadelphia.

The project is being transferred after three and a half years' work conducted by the Company at the Linwood, Pa., Laboratories of Houdry Process Corp. Work completed during this period advanced the project to a point justifying its continuance by a specialized research group.

The project is based on the use of the rare Carbon isotope C-12 as a tracer in reactions simulating body metabolism.

Increased quantities of the isotope will be available for research after completion of a large plant—capable of producing 500 grams a month—at Sun Oil Company's Marcus Hook, Pa., Refinery.

announcing sponsorship of the bio - chemical research project at Temple University Research Institute, Mr. Pew said he anticipated that work on this project would lead to additional research at Temple institute involving the de-velopment of other intermediate uses of Carbon 13.

Although animal and plant life are based on reactions of carbon compounds, which are of interest to the hydrocarbon scien-

hydrocarbon scientists of the petroleum industry, no direct commercial benefit is anticipated.

Much of the bio-chemical research sponsored by Sun Oil has been in collaboration with Dr. Stanley P. Reimann, director of Lankenau Hospital Research Institute and the Institute for Cancer Research, Philadelphia. At these institutions a direct study approach to all phases of cancer and other metabolic diseases has been made.

Temple University Research Institute was organized in Philadelphia to further scientific knowledge and provide research facilities. MODEL No. 16 "SPECIAL"

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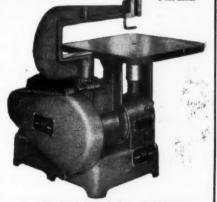
This is a very heavy, powerful machine and is designed for extra heavy filling and sawing, but it performs small work just as well. This type of machine is usually adopted in Ammunition Plants, Airplane Factories and machine shops where heavy and precision filling and sawing is desired. We also manufacture smaller models—Model D—10" Table; Model E.L.—12" Table. Model No. 14—14" table and heavy pedestatis for all our machines.

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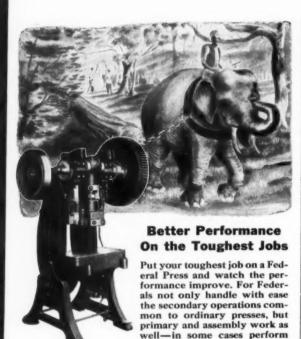
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SPIRAL MANUFACTURING CORP. 3612 NO. KILBOURN AVE. CHICAGO 41, ILLINOIS



in its new Concord mine near Birmingham, Ala., to deliver coal from the bottom of the slope to a tipple at the mine's mouth.

Forty-two inches wide, the belt will utilize more than 330 steel cables, each endless inside the belt's circumference. Each cable in turn, consists of finely stranded. high - tensile steel wire. This quality wire was furnished hy the American Steel & Wire Company, a sister U. S. Steel subsidiary company of the Tennessee Coal. Iron & Railroad Company.

When completed, the belt will weigh 42 tons. It will be delivered to the Alabama mine in five sections and splice into one continuous length at the scene.

The belt's surface is being made with a cover of three-sixteenths of an inch of especially-formulated synthetic rubber on the load-carrying top side, and one-sixteenth on the under surface, for a total belt thickness of about five-

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CONVEYOR BELT SETS RECORD

Available in 8 sizes-

capacity, 6 to 80 tons.

Raising 600 tons of coal per hour to a height of 715 feet will be accomplished by a new rubber conveyor belt under construction in the Goodyear Tire & Rubber Company plant at Akron, Ohio.

W. C. Winings, manager of Goodyear's Mechanical Goods Division, and E. W. Stephens, head of the conveyor belt department, disclosed that this is the greatest height ever attempted in a convey belt operation.

A half-mile long, the belt will be used by the Tennessee Coal, Iron and Railroad Company, a U. S. Steel subsidiary, eights of an inch.

intricate combinations of all

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catalog on the Federal line.

At the head pulley, where power is applied for bringing the coal up the slope from the mining level, two 300 - horse-power motors will be utilized with one on each side of the pulley shaft. Total belt pull on the head shaft will be 68,000 pounds.

As the giant belt ascends the halfmile slope, the rate of rise will be at an angle of approximately 17 degrees, according to Winings and Stephens. Recent development of steel cable cords, instead of conventional fabric or cotton, in the carcass of the belt permits building a belt of this great length.

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DIAMOND TOOL & GAUGE CO.

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JIG FOR BUILDING NORTHROP WINGS

The mechanics of building Northrop flying wings, including the horizontal jig assembly and the tools and methods developed to work the alloy, 75S dural, were described in Los Angeles by D.G. Leland, superintendent of production engineering at Northrop Aircraft, Inc., before the production and tooling session of the Aviation Meeting of The American Society of Mechanical Engineers.

"The construction of the final assembly jig presented several unusual and interesting problems for our tool engineers,"

Leland said. "The jig foundation consisted of an 18 inch reinforced concrete slab out to wing station 400 supported by concrete piers to obtain good bearing. The outer wing supporting mom hers were mounted on concrete piers sunk to the same denth as the center section piers Both the conter section foundation and the outer wing piers were insul-ated from the facfloor tory heavy felt expan-sion joints." Thus, effect of movement of the floor would be reduced to a minimum

"The primary construction material of the iig was black iron pipe and well cas-Supporting. and ing locating members of the jig were braced individually 40 foundation. In no were iig members held relation to other except braces to the floor. By this method we were able to insure that all movement

of the jig would be in a horizontal plane and that all vertical jig members would remain vertical. The airplane was so designed that close tolerances were not required over long distances between critical points."

The final assembly was started by locating the center section of the crew nacelle in a fixed position in the jig. The balance of the jig was so designed that alignment and elevation of subsequent sub-assemblies relative to the crew nacelle was held. They were, however, allowed to float from the crew nacelle.

CARBOLOY TIPPED SCRAPER BLADES

Especially good for hard alloy iron and extremely hard bronze castings. If you are using Anderson Hand Scrapers it is not necessary to buy complete new scrapers in order to use carboloy tipped blades. Simply remove high-speed blade and slip in the Anderson Carboloy Tipped Blade. Available in three widths.





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SPECIAL ALLOY STEEL TAPS INCREASE PRODUCTION ON TURNBUCKLE JOB

Tapping 2¼" deep un-drilled holes in S.A.E. 1020 cold rolled turnbuckles at a speed of 12,000 pieces per machine per 24-hour day is one way in which Thompson Products Company of Detroit is meeting today's demand for greatly stepped-up production without any increase in operator effort.

The particular job involves tapping a hole 24" deep in each end of turnbuckles for automotive tie rods. These turnbuckles are formed by rolling S.A.E. 1020 cold rolled flat stock. The edges of the finished parts are left open for easy adjustment of the front car wheels. Thus the I.D. of the turnbuckle which is later tapped is neither a machined surface nor a drilled hole. Due to the method of making these turnbuckles, rather generous tolerances are allowed, the I.D. being held to .626—633 inch and the O.D. to .870—880 inch. The stock is 0.125 inch thick.

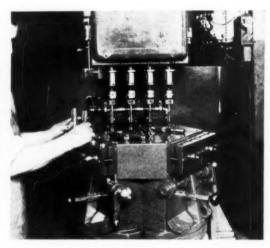
A specially designed multiple tapping head accommodating four taps and fixtures which permit fast manual loading, automatic clamping and automatic unloading at the end of the tapping cycle

A number of different make taps were tried out on this somewhat different operation. "M-11" taps made of a special chrome-cobalt high speed steel developed by Detroit Tap & Tool Company, were adopted as standard on the basis of production records. Thompson Products reports that these taps turned out 500 finish tapped turnbuckles before regrinding became necessary, as against 175 turned out formerly. A total of 8 re-grinds were possible before the tool had to be scrapped.

A spindle speed of 250 rpm is used for tapping; a reverse speed of 500 fpm for backing out the tools. This speed is necessary to keep production up to 12,000 completed units per machine per 24-hour day. Taps are 11/16" x 18", both right and left hand. Only one operator is needed for each machine. Machines currently operate three eight hour shifts per day.

The fixtures and the two machines one right and one left hand—were designed and produced at Detroit Tap and Tool Co.

Tapping 21/4 inch deep holes without drilling at Thompson Products. Production is 12,000 pieces per machine per 24-hour day. Taps made of "M-11" steel—a chromecobalt high speed steel—are used for this operation.



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UNIVERSAL QUICK CHANGE DRILL
... with 12 instantaneous changes
of speed and with selective feed

It's beavy, rigid and versatile... this Baker Drill of the Universal Quick Change type. Assures maximum out of twist drills up to 1½" diameter. Used for heavy duty boring and facing as well as for drilling.

Shown here is Model 150 with standard compound

Shown here is Model 150 with standard compound table. Speed and feed changes convenient to operator. Baker-built dependability...engineered to do the job better and help increase productivity. Write for more details.

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HOBART GROUNDS STUDENTS IN WELDING TECHNIQUES

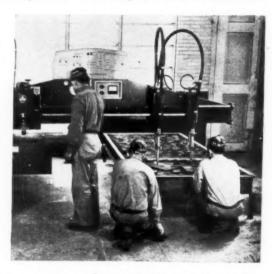
In 1931, to remedy a shortage of trained welding operators, the Hobart Brothers Company of Troy, Ohio, manufacturers of welding equipment, organized the Hobart Trade School of welding. The school was then located in the factory, but in 1940, it was graduated to a modern all-welded steel, fireproof building. An addition to the campus was made in 1947 in the way of a new gas building.

At present, the School has an enrollment of 125 welding students, has been approved by the Ohio State Department stud welding, automatic or submerged are and metal spraying. The course may be taken in its entirety or arrangements made to train in one subject or combination of subjects. Also provided is complete training in welding tool and die steels, including their heat treatment.

Instruction technique stresses "doing." In general, the procedure followed is explanation, demonstration, supervision and practice. Movies supplement other methods of teaching.

Students have private use of an individual welding booth equipped with latest design Hobart Arc Welder and a

Hobart Trade School students examining the new oxy-actylene flame cutting machine installed for pattern cutting.



of Education, and authorized by the Veterans Administration to train veterans under the G. I. Bill of Rights.

Entrance requirements are non-existent. Expenses include tuition, cost of equipment, such as aprons, gloves, helmets, etc., and living expenses. Tuition is \$15.00 per 40 hour week for electric arc welding and \$25.00 per 40 hour week for acetylene welding.

The course covers a period of 16 weeks, an 8 hour day and a 40 hour week, and includes such welding subjects as electric arc, alloy, acetylene resistance, carbon arc, helium hardfacing and tool welding,

welding bench. Each booth is well lighted and ventilated.

Instructors are men who have been employed in actual field work as small jobshop welders, maintenance welders, welders on large production lines, etc. Robert Bercaw, supervisor, has been with Hobart 15 years.

Training equipment consists of all types of welding materials, swing lathes, metalizing machines, hydraulic band and tensile testing machines, drill presses, shapers, complete X-Ray equipment, heat treating apparatus and numerous other pieces of metal working equipment. The

Group of students receiving instruction in pipe cutting with the new pipe cutter.



new gas welding building has just added to its equipment oxy-acetylene flame cutting machine, which cuts metal up to six inches in thickness, and a boiler plate roller used to show the students how to make tanks and smokestacks.

Hobart does not maintain a job placing service as this would require a special license for operating an employment agency. They do, however, refer graduate students to job openings they have on file.

Living expenses are reasonable. As in any other city, living quarters are not plentiful, but out going graduating classes make room for new students. Recently, the School converted a large home into an attractive and comfortable dormitory.

Afterschool recreation opportunities include golfing, tennis, swimming, baseball, movies, boating and fishing.

Recent polls show that 72% of the students obtained welding jobs immediately after finishing their training course. The majority of students are successful in obtaining employment immediately upon leaving school.

Photographs courtesy of Hobart Brothers Co.

LOGAN ARIDIFIER

"Riddy," the new Aridifier engineer, conducts a personal tour through the pages of Aridifier Bulletin No. 147 just released by the Logan Engineering Company. Construction features, tests, and installations are described in tables, charts, drawings, and photographs. The bulletin points out advantages of the Aridifier as an effective dirt remover from compressed air lines. Letter addressed to Dept. BB, Logan Engineering Co., 4901 Lawrence Ave., Chicago, Ill., will procure copy.

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Buffers and Polishers, Grinders, Hole Saws, Drills, and Cleaning Brushes are among the machine tools described in the 32-page catalog of The Bradford Machine Tool Co. of Cincinnati, Ohio. Each description is accompanied by a photograph of the machine tool under discussion. Specifications are also given in every case and a cross section of the Metalmaster Ball Bearing Drill occupies one of the front pages.

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IN THIS ISSUE



Abrasive Cloth, Paper. Disc. Belts, Wheels, Stone Etc., 42, 71, 84, 113, 134, 135, 194, 195
Accessories Fortable Tool, 194-195
Angles, Universal, 57, 265
Arbor Spacers, 304, 333
Balancing Machines, 11, 344
Balancing Ways, 369
Bearings, Bail, 287
Bearings, Oilless, 269
Bearings, Roiler, 221, 287
Bearings, Roiler, 221, 287
Belt Hooks, 316
Belt Surfacers, 336
Bending Equipment, 67, 95, 126
Blades, Band Saw, 26, 91, 320
Blades, Hack Saw, Inside Front Cover, 29, 91, 320
Blades, Hack Saw, Inside Front Cover, 29, 91, 320
Blades, Screep, 369 Wheels, Stones,

Blades, Hack Saw, 1 Blades, Scraper, 369 Borers, Rod, 72 Borescopes, 216

Borescopes, 216
Boring Bars, 276
Boring, Drilling and Milling Machines, 297
Boring, Drilling and Tapping Machines, 65, 224
Boring Heads, 58, 226
Boring Machines, 179, Back Cover
Brakes, Apron, 318
Braches, 103
Broachnes, 103
Broachnes, 103
Bording Machines, 298
Buffers, Portable Electric, 194-195, 321, 388
Burs, 55, 345
Burs, 50, 345
Bu

Buffers, Portable Electric, 194-195, 331, Burs, 55, 345 Bushings, Drill Jig, 297, 317, 319, 359

Bushings, Drill Jig. 297, 317, 319, 339
Carbide Tool Grinders, 337
Carbides and Special Cutting Tools, 146, 149, 296, 284, 310, 319, 345, 365
Centers, Bench. 157
Centers, Lathe. 278
Centers, Lathe. 28, 349
Chucks, Air-Operated. 129
Chucks, Drill, 92, 98, 99, 355
Chucks, Lathe. 48, 98, 99
Chucks, Lathe. 48, 98, 99
Chucks, Wrenchless, 353
Clamps, 36

Chucks, Vernamer Clamps, Toggle, 53, 305 Clamps, Toggle, 53, 305 Clutches, 80, 178, 260, 316, 317 Coating Equipment, 181. Collets, 53 101, 273

Collets, 59 Comparators, 101, 273 Compressors, Air and Gas, 18 Controlling Devices, 128 Counterbores, 17, 27, 118, 149, Countersinks, 83, 280 118, 149, 180

Countersinks, 83, 280
Counting Machines, 280
Couplings, Air, 116
Couplings, Flexible, 280, 272
Couplings, Torque Control, 271
Cutting Tools, 9, 83, 171, 297, 208, 319
Cutters, Keysest, 83
Cutters, Keysest, 83
Cylinders, Hydraulic and Pneumatic, 7, 23, 98, 99,

Cylinders, Hydraulic and Pneumati 299, 354 Demagnetizers, 48, 197 Dial Indicators, 145, 308 Diamond Powders, 215, 329 Diamonds and Diamond Tools, 304

Die Feeds, 85
Die Filers, 182
Die Heats, Threading, 101
Die Haads, Threading, 101
Die Making Machines, 31, 325, 365
Die Polishing Machines, 221
Dies, 325, 353
Die Sets, 50, 53, 89, 112, 261, 323,
Diesel Engines, 18
Dividing Heads, 48, 283
Dowel Plns, 53, 112, 336
Darating Machines, 200
Dressing Fixures, Grinding Wheel, 199, 267, 340
Drill Heads, 73, 345, 359, 362
Drill Jig, 349
Drill Seads, 73, 345, 359, 362
Drill Jig, 349

Drill Jig, 349
Drilling and Tapping Units, 214, 295
Drilling Machines, Multiple Spindle, 56
Drilling Machines, Radial, 32D, 57
Drilling Machines, Universal, 371
Drilling Machines, Universal, 32D,
Drills, Center, Core, Twist, Square, etc., 83
Drills, Deep Hole, 330
Drills, Deep Hole, 330
Drills, Deep Hole, 330

Drills, Drills, Rock, a Drills, Shank, 343 Drives, Gear Shift, 82 Drives, Motor, 305 Machines,

Drives, Gear Shift, 82
Drives, Motor, 305
Duplicating Machines, 379
Dust Control Equipment, 10, 70, 79, 351, 388
Dyes, Layout, 197
Electrode Holders, 234
End Mills, 118, 149, 335
Etchers, 192
Facing and Counterboring Tools, 63
Files, 161, 339
Files, Rotary, 177, 339, 345
Filing Machines, 325
Flexible Shaft Equipment, 21, 66, 73, 171, 218, 350, 361 361

Form Tools, Circular, 335 Furnaces, Heat Treating, 43, 176, 315, 383

runaces, near Treating, 43, 176, 315, 383 Gage Blocks, 165, 308 Gage Stock, 333 Gages, 38, 108, 147, 217, 239, 266, 309, 317, 368 Gages, Pin, 108

Gages, Pin, 108
Gages, Pin, 108
Gages, Pin, 108
Gages, Pin, 108
Gages, Pin, 108
Gages, Pin, 108
Gages, Pin, 108
Gear Checking Instruments, 259
Gear Shaper, 109
Gear Shaper, 109
Gears apd Gear Units, 13, 198, 259, 281, 306, 336
Grinders, Abrasive Belt, 292, 351
Grinders, Alr, 69 242
Grinders, Garbide Tool, 39, 127, 357
Grinders, Genterless, 113, 246
Grinders, Centerless, 113, 246
Grinders, Contour, 371
Grinders, Contour, 371
Grinders, Contour, 371
Grinders, Contour, 371
Grinders, Cylinders, 72, 191, 274
Grinders, Drilli, 31

Grinders, Cutter, Grinders, Cylindrical, 72, 1914, Grinders, Drill, 31
Grinders, Drill, 31
Grinders, Drill, 31
Grinders, Pace Mill, 31
Grinders, Face Mill, 31
Grinders, Forth II, 31
Grinders, Forth II, 51
Grinders, Fortable Electric, 109, 194-195
Grinders, Profile, 182
Grinders, Surface, 8, 32B, 32C, 121, 286, Inside

Back Cover Grinders, Swing Frame, 321 Grinders, Tool Room, Inside Back Cover Grinders, Thread, 101 Grinders, Tool and Cutter, 31, Inside Back Cover

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Grinders, Vertical, 66, 79 Grinding Compounds, 292 Grinding and Polishing Machine, 279 Grinding Tools, 113, 121 Groving Tools, 363 Guards, 309 Guards, 309 Guldes, Tap, 330 Hammers, 219 Handles Gage, 3 Hand Tools, 45 Hammers, 219
Handles Gage, 322
Hand Tools, 45
Heads, Multiple, 9
Head, Tapping, 359
Heads, Tool, 312
Hinges, 283 Hinges, 283
Holders, Die, 92
Holders, Electrode, 234
Holders, Knurl, 311
Holders, Tap, 92, 117
Holders, Tool, 4, 35, 76, 163, 173
Honing Machines, 34, 72
Hooke, Belt, 310
Hopper Units, 225 Hydraulic Equipment (Look for specific item) Illuminating Devices, 28 Indexing Fixtures, 291 Injection Machines, 356 Jig Borers, 293 Jig Mill, 102 Jigs and Fixtures, 311 Tointe 88 Jointers, 78 Keyseaters, 222, 371 Lacers, Belt, 310 Lapping Equipment, 32B, 32C, 72 Latep Dogs. 380

Lathes, Automatic. 11, 19, 101

Lathes, Bench, 122-123, 186

Lathes, Englie and Toolroom, 132, 187, 349

Lathes, Englie and Toolroom, 132, 187, 349

Lathes, Precision, 257

Lathes, Production, 237

Lathes, Serew Cutling, 2

Lathes, Serew Cutling, 2

Lathes, Serew Cutling, 2

Lathes, Tyret, 11, 32A, 101, 130

Layout Materials, 304, 347

Levels, Precision, 87

Locators, Optical, 332

Lubricants, 6,

Lubricators, 33, 37, 351, 364

Magniffers, 285, 306 Numbering Machines, 314 Optisetters, 281 Optisetters, 281
Pantograph Machines, 153
Parallels, 265
Planers, 51, 78
Plastic Molding Material, 270
Plastic Packaging, 181
Plates, Surface, 265
Polishing Machines, 66
Press Brakes, 95
Presses, Arbor, 162, 326
Presses, Pott, 230, 363
Presses, Pott, 230, 363
Presses, Hydraulic, 7, 16, 107, 110, 354, 369

Presses, Punch, 159, 193, 245, 334 Presses, Spring, 313 Profile Turning Machines, 369 Pullers, Die Set, 33 Pumps, Coolant and Lubricant, 26, 47, 290 Pumps, Vacuum, 18 Punches, 325, 353 Pyrometers, 207 Racks, Stock, 207, 260 Rams, Hydraulic, 356 Reamers, 83, 118, 149, 335 Reamer Drivers, 349 Rectifiers, 128 Reels, 39, 204, 288 Retaining Rings, 61 Rivets Setters, 106 Riveting Machines, 7, 298, 397, 330 Roll Feeds, 39 Routers, 388 Sanding Equipment. 66. 78. 321
Saw Sharpeners. 290
Sawing & Filing Machines, 325
Sawing Machines, Band. 73, 78, 81, 145, 185
Sawing Machines, Band. 73, 88, 185
Screw Machines, 122, 223
Screw Machines, Automatic. 29, 62
Screw Machines, Automatic. 29, 62
Screws, Cap. Set, Socket and Machine, 53, 96, 172
Screws, Cap. Set, Socket and Machine, 53, 96, 172
Screws, Transfer, 348
Screvices, Milling, Grinding, Lapping, Rebuilding, Repairing, Business, etc., 150, 206, 263, 304, 336, 343, 367, 373
Shapers, 12, 32A, 51, 78, 115, 155, 169, 257, 298
Shaering Machines, 90, 155, 220, 279, 325
Shearing Machines, 90, 155, 220, 279, 325
Shearing Machines, 90, 155, 220, 279, 325
Shearing Machines, 91, 154, 154
Sine Bars, 308
Sine Plates, 57
Sleeves, 103
Slotters, 51
Soldering Tools, 288
Spacers, 15, 305
Spacing Collars, 313, Speed Reducers, 285
Spot Facers, 17, 119
Springs, 296, 345
Steel and Steel Stock, 41, 91, 136, 329
Steels, 136
Superfinishing Machines, 11
Surfacing Machines, 66, 73, 246, 336
Switches, 324
Tables, Elevating, 204, 224, 328 Sanding Equipment, 66, 78, 321 Saw Sharpeners, 290 Switches, 324

Tables, Elevating, 204, 224, 328

Tables Feed, 277

Tables, Elevating, 208

Tables, Evaluation, 208

Tape, Attachments, 306

Taper, Measuring, 145

Tapping Machines, 66, 117, 124, 290, 343, 371, 388

Tap & Die Sets, 381

Thread Chasers, 105

Tool Bits, 223

Tools, Cutting Off, 110, 298

Tools, Turning, 32

Tote Pans, 207

Tracer Controls, 153

Transformers, 104

Transmissions, 136, 262

Turrets, Lathe, 303, Turrets, Lathe, 303, Valves, Air. 7, 23, 75, 299 Valves, Hydraulic, 112 Vises, Bench and Machine, 48, 148, 199, 2 280, 282, 311, 319, 323, 345, 347, 356, 361 Welding Equipment and Supplies, 1, 104, 238, 358,

Wire and Rod Cutters, 282 Wrenches, 98, 99 Wrench Sharpeners, 351

208, 260,



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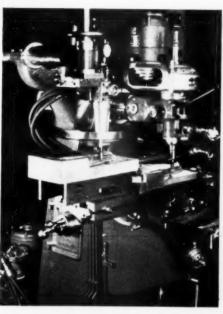
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Index to Advertisers

About Comm 6 Mr. 11 C
Abart Gear & Machine Co19
Abrasive Products, Inc 4
Accrevion Co
Accurate Bushing Company. 29 Ace Abrasive Laboratories. 32
Ace Abrasive Laboratories. 39
Acme-Danneman, Inc. 261-24
Acme Diamond Tool Company30
Acme Industrial Company35
Acme Tool Co
Acro Motal Stamping Co.
Acro Metal Stamping Co
Aero Tool Co
Aget-Detroit Co
Aircraft Mchry. Corp10
Airo Products Co 7
Airway Pump & Equipment Co 2
Alco Tool Co 9:
Allied Machinery & Supply Co24
Allen Co., A. K
Allied Products Corp
Almond Co., T. R35
Alaco Company23
Amendola & Co., Michael33
American Diamond Tool & Gauge Co36
American Metal Products Company296
American Saw & Mfg. Co 9:
Anderson Bros. Mfg. Co361
Andersons, Inc33
Annis Co., R. B
Arguto Oilless Bearing Co
Armstrong-Blum Mfg. CoInside Front Cove
Armstrong Dres That Co
Armstrong Bros. Tool Co.
Arter Grinding Mch. Co19
Atlas Press Company
Auto Moulding & Mfg. Co28
Avey Drilling Machine Co 56

Baker Bros. Inc	11
Baldor Elec. Co	27
Bartelt Engineering Co	ii
Baumbach Mfg. Co., E. A35	53
Bear Mfg. Co34	14
Behr Products Co	rê.
Benchmaster Mfg. Co	14
Benton Company	11
Beverly Shear Mfg. Co25	20
Blaner Mfg. Co	12
Bloomfield Tool Corp33	88
Boice-Crane Co	78
Bond Co., Chas	85
Bremil Mfg. Co	3.3
Breuer Electric Mfg. Co3:	51
Bridgeport Machines, Inc15	29
Bridgeport Safety Emery Wheel Co	21
Brighton Screw & Mfg. Co20)3
Brown Corp., W. B14	18
Brown Engineering Co	30
Brown & Sharpe Mfg. Co14	17
Bub & Son, George F25	12
Buffalo Force Co	37
Buffalo Mchry. Co2	71
Burke Machine Tool Co2	15
Burr & Son. J. T	16

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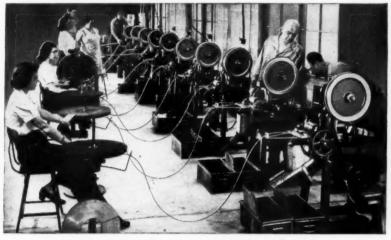
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Edlund Machinery Co. 44 Edroy Products Co. 285 Eisler Euctroering Co. 104 Eisert Froducts Co. 2128 Eigh Pool Works 122-123 Engin Co. 303 Engin Equipment Co. 30 Engin Equipment 20 Errington Mechanical 25 Esco Engineering Co. 340 Extro Tool Co. 44	Ingersoll-Rand
Excelsior Tool & Machine Co	J. & S. Tool Co. 201 Jefferson Engrag & Mfg. Co. 371 Jefferson Machine Tool Co. 279 Johansson Div. (Ford Motor Co.) 165 Joliusson Gas Appliance Co. 176 Johnson Machine & Press Corp. 368 Johnson & Sons, Wm. C. 318 Jones & Lamson Machine Co. 161
Fakes & Co., Jos. B. 233 Falcon Tool Co. 118 Federal Foundry Supply Co. 282 Federal Press Co. 366	Jones & Lamson Machine Community
Pakes & Co., Jos. B. 233 Falcon Tool Co. 118 Federal Foundry Supply Co. 282 Federal Press Co. 366 Fellows Gear Shaper Co. 169 Flexrock Company 338 Ford Moto Co. 345 Ford Moto Co. 34 Formsprag Co. 10hausson Div. 316 Fray Machine Tool Co. 348 Fullfo Specialties Co. 47	Xatolight 282 Kennametal, Inc. 310 Knu-Vise, Inc. 36
Fulmer Co., C. Allen	L. & J. Press Corp
Gairing Tool Co. 180 Galland Henning Mig. Co. 23 Galland Henning Mig. Co. 12 Gallmeyer & Livingston Co. Inside Back Cover Gardner Machine Co. 71 Gear Specialties 13 General Eng. & Mig. Co. 93·115 Genesee Mig. Co. 63 George-Anderle Mig. Co. 119 Gishoft Machine Tool Co. 119 Gishoft Machine Co. 364 Gorron Machine Co. 163 Gorron Machine Co. 153 Gorron Machine Co. 31 Graham Mig. Co. 31 Greenerd Arbor Frod. 306·349·30 Greenerd Arbor Frod. 306·349·30 Greenerd Arbor Frod. 306·349·30 Greenerd Arbor Frod. 306·349·30 Grobe File Co. 306·349·30 Grobe File Co. 407·40 Grobe File Co. 407·40	L. & J. Press Corp. 290 L. W. Chuck Co. 48 Larkin Lectro Products Corp. 235-296 Lassy Tool Company 235-296 Lackinger Machine Co. 249 Leckinger Tool & Mfg. Co. 297 Lenox Instrument Co. 216 Lewthwaite Machine Co. 7 255 Lime Electric Motor Co. 325 Lime Electric Motor Co. 325 Lime Electric Motor Co. 326 Linley Brothers Co. 293 Littell Machine Co. F. J. 204 Logan Engineering Co. 232 Logan Engineering Co. 232 Lucas & Son, J. L. 267 Luma Electric Equipment Co. 288 Lyon Machine Corp. 328 Lyon Machine Corp. 328 Lyon Haghine Co. 368 Lyon Haghine Corp. 328 Lyon Hag
Gruendler Crusher & Pulv. Co294	M. B. Products Co
Hall Level & Mfg. Wks. \$7 Hall Mfg. Co. \$349 Hamilton Fool (Co. 224 Hammond Machinery Builders 79-292 Han-Dee Spring & Mfg. Co. 367 Hardinge Brothers Research 7 Hardinge Brothers Research 7 Hardinge Brothers Research 7 Hardinge Brothers Research 7 Hardinge Brothers 16 Harper Co. H. 360 Hart Machine Co. 293 Hartford Special Mchry. Co. 16 Haskins Co. R. 218 Heim Co. 221 Heim ann Mfg. Co. 348 Heim Co. 348 Hilliard Corp. 78 H Speed Hammer Co. 307 Hobart Brothers Co. 296 House of Commerce. 35 House of Commerce. 35 Howe & Son Inc. 290 Humm Safety Equip. Co. John. 288 Huron Machine Froducts 32 Hypro Tool Co. 54 Huron Machine Froducts 32 Hypro Tool Co. 54	M. B. Products Co
Ideal Industries, Inc. 97 Independent Pneumatic Tool Co. 116 Industrial Products Suppliers. 333	Morey Machinery Co. 232-298-306 Motor Tool Mfg. Co. 114 Mummert-Dixon Company 210 Munton Co. 356

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National Acme Co	Sid Tool Co. 207
Plunket Machine Co. J. E. 208 Pneumatics Inc. 299 Porter-Cable Machine Co. 246 Potter & Johnston Mch. Co. 173 Pratt & Whitney 55 Procunier Safety Chuck Co. 117 Production Machine Co. 336 Producto Machine Co. 312 Protucto Machine Co. 32 Protucto Machine Co. 32 Prutton Machine & Tool Co. D. H. 124 Pyrometer Instrument Co. 207 Prosect & Son, Thomas 207 Protucto Machine & Tool Co. D. H. 224 Pyrometer Instrument Co. 207 Protect 207	Tannewitz Works 185 Taylor & Fenn Company 313 Taylor Mch. Co. 336 Feeter. C. B. 280 Tombas-Johnen 350 Torit Manufacturing 70 Trindl Products, Ltd. 387 Troyk Mig. Co. 283 Tweco Products Co. 234
Queen City Machine Tool Co300	U. S. Electrical Tool Co
R & L Tools 32 Racine Tool & Machine Co. 110 Raymac Mfg. Co. 146 Raymac Mfg. Co. 287 Reading Machine Co. 282 Reading Machine Co. 222 Redees-Niblock Inc. 301 Reitool Corp. 88 Rivett Lathe & Grinder, Inc. 28 Robbins Eng. Co. 57 Rockford Clutch Dr. 31 Rock Onderine Works. 21 Roof Machine Works. 21 Roof Operating Valve Co. 75 Rotor Tool Co. 69	Vanderwall Co., E. H. 278 Vascoloy-Ramet Corp. 77 Victor Machinery Co. 1810 Victor Machinery Exchange 380-38 Vonnegut Moulder Corp. 321 Wade Instrument Co. 347
Rose Operating Volume 75 Ross Operating Volume 75 Rose Operating Volume 75 Rose Operating Volume 75 Rutland Tool Service	Waldes Kohinoor, Inc. 61 Walker Co, O. S. 64 Walker Turner Co. 73 Walls Sales Corporation. 351 Walton Co. 2082-232 War Assets Administration. 211 Wardwell Mfg. Co. 355 Wello Mfg. Corn 84 Wells Mfg. Corn 84
Sales Service Machine Tool Co. 159 Sanford Manufacturing Co. 286 Savage Cutlery Inc. 308 Schauer Machine Co. 197 Scherr Co. 608 Scherr Co. 208 Scherr Co. 208 Scherr Co. 208 Schmidt Inc., Geo. 239 Schultz & Anderson Co. 336 Screw Machine Specialty Co. 343 Seal Peel 181 Sentry Co. 43 Sentry Co. 43	War Assets Administration. 211 Wardwell Mfg. Co. 355 Weldon Roberts Rubber Co. 84 Wells Mfg. Corp. 81 West Coast Aero Tool Co. 233 White Dental Mfg. Co. 171 Whiter Metal Tool Co. 27 Willer's Carbide Tool Co. 367 Willer's Carbide Tool Co. 367 Willer's Carbide Tool Co. 36 Wittek Mfg. Co. 30 Woodson Tool Co. 27 Woodworth Co. A. 293-309 Wright Inc., L. G. 200
Seneca Falls Machine Co. 13	Yost Mfg. Co. 345 Yohe Supply Co., Wm. S. 207 Young Arbor Co. 336





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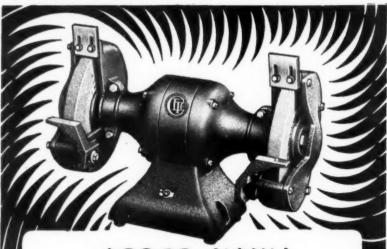
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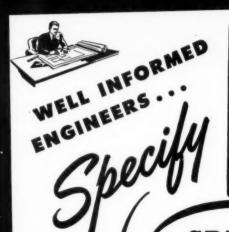
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Hydraulic Feed
Surface Grinder

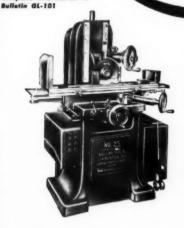
Complete information in

 No. 4 Grand Rapi Universal Cutt and Tool Grind

Complete Information

grinding jobs

Complete information Sulletin No. 10





What "GRAND RAPIDS" Quality Means:

G & L cast their own close-grained gray iron, machine all parts to micrometric tolerances, and precision-assemble grinding machinery of unsurpassed performance. *Grand Rapids* means *top* quality in grinding machinery.

GRILL EVELLE OF CO.

GALLMEYER & LIVINGSTON CO., 405 STRAIGHT AVE., S.W., GRAND RAPIDS 4, MICHIGAN



A NEW LINE OF PRECISION CONTOUR TURNING AND

BORING MACHINES

Accurate and Fast — Cam and Air Actuated

Featuring contours or combina-

tions may be generated with a single-point tool. Besides all the regular jobs of straight precision boring and turning. facing and chamfering, it will produce lands,

recesses, flanges, steps, counterbores, and radii. 2. A disc type cam for each table gives positive action consistently throughout the day - from the first to the last piece - uninfluenced by temperature changes.

3. Through positive cam action, tool approaches on rapid traverse to within .005 of the work and immediately starts to feed. Tool may cut on feed-in or drawback stroke, or both for rough and finish cuts. On return stroke, tool jumps clear eliminating drag off marks. When moving between intermittent or successive cuts, tool goes into rapid traverse.

4. Uniform temperature, anti-friction bearings, and super-precision spindles provide spindle speeds up to 7,500 RPM. Mechanical precision chucking operated by air cylinders, Neither chucking nor unchucking operation affects preload or position of spindle bearings.

5. Only one dimension need be inspected on any one set-up, regardless of the number of diameters produced by any one single-point tool, Cams control and positively repeat from piece to piece

6. Set-up of machine depends entirely upon nature of job. Work may be rotated in spindles or mounted on table, loaded from the front of the spindle or through the spindle. Spindles may be raised, lowered, or separated. Two spindles are standard, but more may be added. Changing job set-up simply requires replacing two cams setting tool for size and changing chucks,



THE MIDST OF EVERYTHING AT THE SHOW

Model 35

on may see this machine in operation in our Booth o, 311 at the Show. We will also have a complete ne of six spindle automatic screw machines, mr, six and eight spindle chucking machines, double end chucker, and a new revolutionary eret lathe. We'll be seeing you September 17.



NEW BRITAIN, CONNECTIC

